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AUGUST, 1858.

CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

The Formation of Bars in Rivers and Harbors. By D. S. HOWARD, C. and M. Engineer.

As a general rule, bars are formed only by eddies. The formation of bars in the straight part of rivers usually commences in shoal places, where an upward direction is given to the water in its passage from a deeper portion of the channel, and the nature of the banks is of such material as to give way before the tendency of the water to spread, in accommodating the width to the required discharge with a diminished velocity and depth. The motion of the water in such places, particularly near the bottom, having a direction upwards forms a vertical eddy, depositing whatever comes down the stream having a relative weight sufficient to overcome the diminished force of the water, from the action produced by the form of the bottom, forming a bar more or less compact, according to the nature of the material deposited.

It is generally supposed, that where a bar has once formed, if removed, it will form again, but if the cause be removed by excavating, where the bar is as deep as it is immediately above, making the bottom uniform, there must some other cause intervene before another bar can be formed in that place.

Horizontal eddies form projecting points from the shores of rivers by virtue of a similar law, which diminishes the force of a current in proportion to the obstruction that diverts it from a right line, thereby crowding the thread of the stream towards the opposite bank from

where the eddy was first formed, which wears away and furnishes material for the deposits below, a part of which is transferred by the eddy mentioned to increase the point, until the current comes in contact with a resisting material, and becomes contracted sufficiently to create a current with power to prevent any further deposit on the point, when the place of deposit will have been gradually transferred to the centre of the eddy, where an island will eventually be formed; or if the current should not come in contact with any resisting material it would continue to wear away the bank in the same direction, and returning in a circuitous route to the original bed of the stream below, until the natural descent of the stream was so far overcome by the relative distance of the new circuitous route as to weaken the current sufficiently to render it harmless. (Such is the law that guides the Mississippi and many other streams with yielding banks.) Then, if there be water enough for the purposes of navigation at all times, and the regimen of the river fixed, there would be no more trouble, but as the regimen of a river cannot become fixed unless measures have been taken to keep back the freshets common to all streams, we must expect that at a different level from the most usual flow of the stream, the current will come in contact with other obstructions projecting from one side or the other, forming new eddies and other deposits, changing materially, perhaps, the course of current and width of the stream, plainly showing that no river can have a fixed regimen, until the freshets are in some measure under our control.

With sufficient reservoirs at the head waters of a stream to control the freshets, we have not only improved the river permanently for the purpose of navigation, and the country with water power, and the facilities for irrigation, but if the stream extends to the sea coast, the harbor at the mouth is also permanently benefited by the absence of the material for deposits usually brought down in large quantities by freshets, forming bars wherever the shape of the bottom or sides of the harbor or pass, afford a sufficient obstruction to a straight course of the current.

There is a popular fallacy in the common observation that bars in the tide waters of rivers are formed by the meeting of the tide with the current of the river; without thinking that there is no point within the range of the tide from the mouth of the river up, where the two currents do not meet at some stage of the tide, such observations pass current. Bars are formed at the meeting of currents, but it is where they continue to meet for some length of time, forming eddies either vertical or horizontal, or both, but when the tide and river meet, the force of the stream is overcome by the tide, and both pass up together with less and less force, until it becomes infinitely less and less, when the *backwater* will be found to have extended far above the change of current, and accumulated sufficient force to overpower the exhausted tide, which it accompanies with increased power back to the sea, distributing their deposit wherever the contour of the bottom or sides of the stream favor the formation of eddies, and at no other places.

When deposits are made in still water, they are in the form of flats, and are generally a long time in forming, but whenever short shoals obstruct the navigation of a stream, they will be found on examination, to be either an original formation, or a bar formed in accordance with the above mentioned laws, that is, from some irregularity in the bottom or sides of the stream above, causing eddies either horizontal or vertical, or both. Bars are sometimes formed by the action of currents produced by winds and waves at the mouths of rivers and entrances to harbors, which seems to clash with "the most commonly received theory," according to Mr. Mahan, which is, "that a wave is a simple oscillation of the water, in which each particle rises and falls in a vertical line, a certain distance during each oscillation, without receiving any motion of translation in a horizontal direction." Without going into an investigation of the whole conduct of waves, we may assume here, from common observation, that water does receive an impulse from the wind in a horizontal direction sufficient to move not only sand, but stones weighing a ton or more, which have been thrown over the pier at Oswego, on Lake Ontario, State of New York, four or five feet high above the water by the action of the wind and waves.

Any one who will observe the effects of the wind blowing parallel to the bank of a sea, will see the waves gradually change their direction as they approach the shore, as if the wind were blowing towards the beach, plainly indicating a motion of the water in the direction of the wind, and at a distance from the shore to be greater than at the shore, on account of the resistance offered by the inequalities of the beach. It will also be observed, if the material composing the beach be movable, that it will be shifted more or less in the direction of the wind, and formed into small projections in the shape of horizontal waves.

It is evident from such observations, that if a wind prevail parallel with the sea coast where the mouth of a river or a pass into a bay or harbor be situated, and if there be a movable material on the coast sufficiently heavy to sink in salt water, there will be a tendency to form a bar from the windward side of the channel, in the direction indicated by the force of the outward current, and the power of the waves, the relative force of the waves increasing as the bar proceeds outward, and that of the outward current diminishing as it expands, causing the bar to bend to the opposite bank in the form of a segment.

The laws which govern the formation of bars when known are very simple, but the circumstances that attend their action are varied in the extreme; therefore a true knowledge of the subject requires long and patient experience, strict and mature observations, and well digested deductions, untrammeled by favorite ready-made theories, which are always fatal to just conclusions from extensive and varied premises. Less perfection in knowledge of the subject, however, will show that bars are always formed by eddies, but eddies do not always form bars, for the reason that a material suited in texture and weight to the velocity of the eddy is always necessary. If the material be too fine or too light for the power of the eddy, it will be kept in motion until some

slight change in the force or direction of the current causes it to pass off in tangents, when it finds its way into some less turbulent eddy, calculated to give it rest.

The material for bars is often wholly absent where eddies prevail, which directs our attention towards a more remote cause of their formation, the furnishing of the material. This is done most extensively and almost wholly by freshets; the principal precaution, then, is a control over the head waters of the rivers by means of reservoirs, which will not only prevent the obstruction of navigation, but the destruction of an immense amount of property. We have now only to take a trip on the Mississippi to realize the wisdom of Mr. Ellet's plan of improving the Ohio River, which, if it had been done accordingly, it would be easy to see without an estimate, the inconsiderable sum it would have cost, compared with the expense of dykes, crevasses, and the property destroyed by the present freshet on the Mississippi, which would have been effectually prevented by the improvement of the Ohio alone.

Corpus Christi, Texas, April 30, 1858.

Sliding Friction. Diminution of Sliding Friction as the velocity increases, particularly in the Friction of Cars on Rails: Formula which represents this Diminution. By M. H. Bochet.

The excellent experiments of M. Morin (performed at Metz in 1831 and 1833,) upon sliding friction, placed beyond all doubt the law previously announced by Coulomb, that within the limits and in the conditions of these experiments, the sliding friction was independent of the velocity and of the extent of surface, and varied only with the pressure and the nature and condition of the surfaces in contact. So that this friction could be represented by the formula $f = p\,\kappa$. Where p is the pressure upon the surfaces, and κ a coefficient, the value of which depends on the nature and condition of the surfaces. But in these experiments, the velocities varied only from 0 to 3 metres per second, and in the experiments of Coulomb it was still less. It might then be doubted whether, under very different conditions, (for instance, in case the velocities should vary from 0 to 25 metres per second, as happens on railroads, when the trains are checked and some of the wheels slide over the rails, and in many other cases,) the same law would continue to govern the friction.

The precise coefficient in the peculiar case of the sliding of car-wheels over the rails was also to be determined in the various conditions of the rails.

New experiments instituted for this purpose in 1851, by M. J. Poirée, showed, that at least in the case of the friction on railroads, and for velocities varying from 4 to 22 metres per second, the friction diminished as the velocity increased.

Again, M. Nap. Garella, and the author of this Memoir, made, in

1856, experiments on the stopping of trains upon railroads, the results of which led to the same conclusion. And again, the same fact is developed by the experiments on the stopping of cars by the shoe-brake, made by M. Poirée in 1856.

The author sought to discover the precise law, and the formula which would represent the variation of the friction with the velocity, at least in the particular case of railroads, and he thinks that he has succeeded, by the graphic mode and by a series of deductions, in showing that this variation may be represented by the formula $f = \frac{p\,\text{K}}{1 + a\,v}$: where f represents the intensity of the friction; p, the pressure on the rails; K, a coefficient depending entirely on the condition of the rails, (the tires of the wheels, and surfaces of the brakes, being of wrought iron like the rails.) (This coefficient is to be taken $= 0{\cdot}3$, when the rails are at their maximum dryness: 0·25 when they are very dry: 0·2 when dry: 0·14 when they are wet.) v is the velocity: and a is a coefficient whose value depends principally upon the manner in which the sliding takes place, (whether direct, that is, the wheels sliding over the rails, or by means of a shoe.) This coefficient appears to vary very slightly with K: but this variation, even if it were certain, would not be of sufficient importance to be taken into account. The values of a to be assumed (the variations being calculated in metres per second,) are 0·03 when the wheels slide directly on the rails: 0·07 when a shoe is interposed.

The author thinks that this formula is in sufficiently exact accordance with the experimental results of M. Morin: the term $a\,v$ becoming too small to affect the results at his velocities; he thinks, moreover, that when the resistance of the air is taken into account, the discussion of these results shows a commencement of the diminution of the friction with an increasing velocity. He believes, therefore, that this phenomenon is general, and that it may be expressed by the formula above, or perhaps better by the formula $\frac{f}{p} = \gamma + \frac{k\,\gamma}{1 + a\,v}$. K keeping the values determined for it by M. Morin, as long as the condition of his experiments are kept, while the values of a, (and perhaps, sometimes of γ,) must be determined in the different cases of slipping.

Certain facts stated in the memoir also lead to the suspicion, that under conditions very different from those of M. Morin's experiments, the friction may not be entirely independent of the extent of the surfaces, but this subject will require an especial study.—*Comptes Rendus de l'Académie des Sciences de Paris, April* 26, 1858.

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NOTE.—It is worthy of notice in this connexion, that the observations of the Committee of the Franklin Institute, upon the friction of vessels being launched, lead to a coefficient only about one-half as great as that determined by M. Morin. See *Journal Franklin Institute*, 3d series, vol. vii, page 108. ED.

For the Journal of the Franklin Institute.

On the Relative Evaporating Power of Brass and Iron Tubes.

By J. R. Robinson, Esq., Engineer.

In the discussion that followed the reading of the paper on the relative evaporating power of brass and iron tubes, before the "Institution of Mechanical Engineers," by Mr. George Tosh, as reported in the June number of the *Journal of the Franklin Institute*, one very important fact seems to have been lost sight of, which is, that in locomotive boilers of the ordinary construction, combustion goes on to some extent within the tubes, that is, the combustible gases do not all unite with oxygen in the fire box of the boiler, but the mixed gases are drawn into the tubes while the combustion is going on. Now the greater the conducting power of the tubes—other things being equal—the sooner will the temperature of the gases be reduced below that necessary to insure their chemical union: so that, in such a boiler it may make but little difference so far as its evaporating power is concerned, whether brass or iron tubes are used, for what is gained, on the one hand, by the greater power of the brass to transmit the heat from the gases passing through the tubes to the water in the boiler, may be balanced by the loss arising from the less perfect combustion of the gases within the tubes. While on the other hand, although the iron tubes do not transmit the heat from the gases so rapidly as in the case of the brass tubes, the temperature of the gases is not so soon reduced below that necessary to insure combustion, and more heat is *generated* from the same weight of fuel.

Experiments made by the writer in January, 1855, with water as the heating medium instead of gases, as in the case of the locomotive boiler, gave the conducting power of copper, brass, and iron tubes as follows:

Iron, 100 Brass, 136 Copper, 171

Experiments made by J. R. and H. S. Robinson, of Clinton, Mass., in January and February, 1856, with brass and iron tubes in boilers so constructed that combustion took place before the gases were drawn into the tubes, resulted in showing that 1000 square feet of brass tube surface, was equal in evaporating power to 1300 square feet of iron tube surface.

Clinton, Mass., June 22d, 1858.

For the Journal of the Franklin Institute.

On Curves for Mechanical Draughtsmen. By H. Howson, C. E.

Curves form an indispensable adjunct to the mechanical draughtsman's stock of instruments. Without them it is impossible to give to the details of machinery those forms instrumental alike in presenting a pleasing effect, and in affording the proper strength at the expense of the smallest amount of material.

The want of useful and graceful curves is inadequately supplied by the variety of scrolls imported from France and Switzerland, an exten-

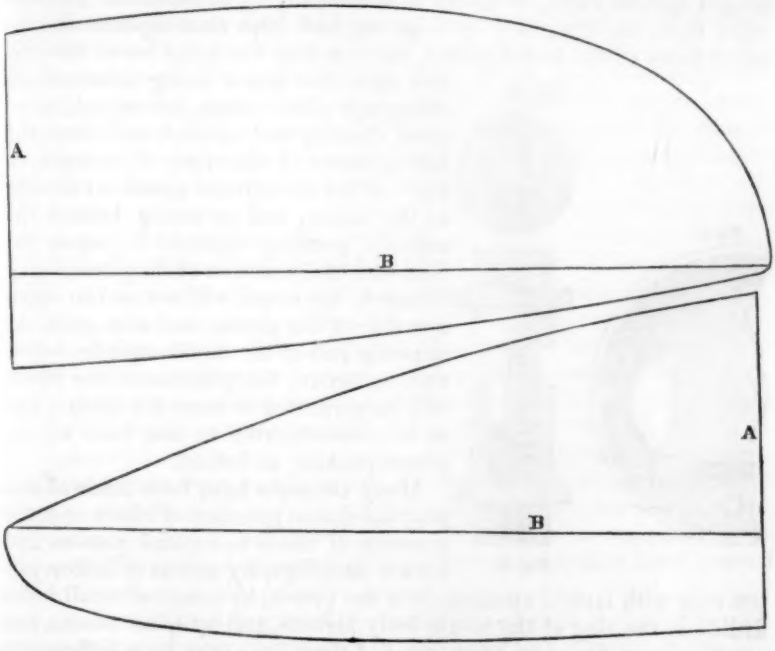
sive variety of which is required to meet the exigencies of the draughtsman.

The frequent use for, and constant want of, efficient curves, induced the writer several years ago to make experiments, with the view of producing a variety of curved forms, independent of any known rules for laying them out. It was found that by taking a sharp pointed pencil in the right hand, holding the whole arm at liberty without any rest for the wrist or elbow, stretching the arm out, and bringing the pencil with a very sudden sweep towards and from the body, with the point of the pencil in contact with a sheet of smooth drawing paper, the most graceful forms may be produced. These forms may be varied and modified so as to present abrupt or gentle curves by altering the position of the wrist, elbow, and shoulder joints, with respect to each other, before the pencil is brought in contact with the paper, and by altering the length and breadth of the sweep given by the arm.

It is indispensable to the formation of a pure curve, that the movement of the pencil should be sudden.

The annexed engraving represents two curves produced in the above described manner.

For convenience of insertion in this periodical, the instrument is shown



in two parts. To render it complete, the transverse line A, of one figure should coincide with that of the other, and the horizontal lines B, should be in the same straight line.

This curve has been selected for illustration as one which has been

found practically useful, the original having been the writer's constant companion for the last fourteen years. The number of objects to which the two edges of the instrument are applicable is somewhat astonishing. Its utility indeed can only be appreciated by actual use. By tracing the figures with a fine pointed pencil, pasting the two tracings in their proper relative positions on a piece of veneer of pear, apple, or boxwood, as the best material, and, when dry, cutting and filing the edges to the lines, and subsequently removing the paper with a wet sponge, fac similes of the original curve may be produced. By passing the finger along the edges of the curves, the slightest irregularities may be discovered, and these readily removed with a fine file.

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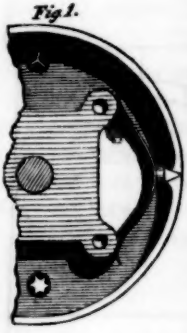
*Improvements in Pistons.**

We give the accompanying illustration of a very important, but exceedingly simple invention, by Messrs. Molineaux & Nichols, of the Brighton Railway Locomotive Works, for superseding the use of metal springs for expanding metallic piston packings. They simply bore the sides of the piston truly, and fit into the hole so bored a double-hinged spindle valve, as shown in accompanying illustration. The two valve faces are expanded by a spring, and kept close against the interior faces of the piston plates, surrounding the holes bored therein, and upon the steam being admitted on either side of the piston, the valve is acted upon thereby and opened, and thus the full pressure of the steam is brought to bear within the annular space or chamber in the piston, and so acting behind the metallic packing expands it; upon the direction of the motion of the piston being changed, the steam will act on the opposite side of the piston, and also upon the opposite end of the double-spindle valve, and, as before, the pressure of the steam will be permitted to enter the piston, and so be communicated to the back of the piston packing as before.

Fig. 2.

Fig 1.



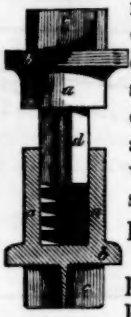


Fig. 3.

Many attempts have been made to employ the elastic pressure of steam and the pressure of fluids to expand pistons and bucket packings, by means of hollow piston rods with lateral openings into the piston, by means of small holes drilled in the ring of the single body pistons, and by other means, but practically, so far as we know, none of these have ever been sufficiently successful to permit of their being continued in use. Now the present invention has been practically tested in the most severe and sufficient manner, and we have watched with considerable interest these trials,

*From the London Artizan, June, 1858.

and we are enabled to state that they have proved entirely successful; and one point which is of considerable importance is, that no loss of steam results from its use, the piston space not being, as might be supposed, filled and emptied at each stroke; as, indeed, after the piston has been once filled with steam, it is but the pressure which is communicated alternately at one side and the other, the original volume remaining unchanged.

For locomotive engines there is a very great advantage pertaining to this plan, viz: that when the steam is shut off, as when descending inclines, &c., the pressure is removed, and the friction which would be due to the constant pressure of metal springs does not occur.

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*Penn's Patent Apparatus for Taking the Thrust of Screw Propellers.**

Mr. J. Penn, Engineer, of Greenwich, has patented an improvement in apparatus for taking the thrust of screw propellers, in which the use of bearings of wood, already found so successful in other cases, is applied to the purpose. A disk or plate (by preference made in two parts, so as readily to be fixed and removed) is applied between the boss of the propeller and where the propeller shaft passes into the ship or vessel. In this plate or disk are fixed pieces of hard wood at intervals in such manner that the pieces of wood somewhat protrude beyond the surface of the disk or plate. The disk or plate is made suitable for the propeller shaft to turn freely in an opening through its centre, and it is applied in such manner as to be held from turning with the propeller shaft. The forward surface of the boss or nave of the propeller, or of a plate fixed thereto, is formed or turned truly, and is, when the propeller is at work, constantly pressed against the projecting surfaces of wood in the plate or disk, which is, as before mentioned, applied where the propeller shaft passes into the vessel. The thrust of the propeller is thus received by the pieces of wood fixed to the plate or disk, and this, being attached to the stern post of the ship or vessel, transmits to it the thrust of the propeller. The plate or disk and the wood fixed to it, being immersed in the water, will be constantly well lubricated therewith. Although it is preferred to have the pieces of wood applied to a plate or disk capable of being readily removed, this is not essential, and in place of the pieces of wood being applied, as above explained, they may be applied to the boss of the propeller, or to a plate or disk fixed thereto, or to the propeller shaft, so as to revolve therewith. In which case the pieces of wood, when the propeller is at work, will be pressed against a plate or surface formed or fixed around where the shaft of the propeller passes into the ship. And, although it is preferred that this apparatus should be external of the vessel, like apparatus to take the thrust of a propeller may be applied within the vessel, in which case the rubbing surfaces should be kept well lubricated with water.

* From the Mechanics' Magazine, March, 1858.

For the Journal of the Franklin Institute.

Wixted's Railroad Chair Press. Notice of a Hand Press for turning up the Lips or Wings of Wrought Iron Railroad Chairs. Invented by Mr. JAMES WIXTED, Master Blacksmith of the Upper Schuylkill Railroads, in Pennsylvania.

The general use upon American railways in their original construction of light wrought iron joint chairs, weighing from 7 to 10 lbs. each, (with lips turned up,) has caused the erection in many places, of factories, where stamps and presses operated by power, manufacture these chairs from plate iron, the former cutting out the blank and punching the spike holes, the latter turning up the wings from the heated blank.

There are many cases, however, especially in the after maintenance of railway superstructures, where for repairs or extensions, it is desirable to have in the smith shops of a railroad, the means of readily turning up a wrought iron chair from a flat plate, without erecting a regular chair factory for that purpose, and such is the object of the present invention.

Col. Franklin Hewson, C. E., desiring to adopt upon the railroads under his charge, a wrought iron chair with unusually long wings (12 inches) so as to make with a long wrought iron chair, a joint between ties, desired his master blacksmith, (Mr. Wixted,) to prepare the means necessary to effect his purpose of making a long wrought iron chair, of the kind described in the late discussion before the Franklin Institute on "*rail joints.*"

Mr. Wixted devised the very simple hand press illustrated in the annexed cut, which is found to answer perfectly its intended purpose of turning up a chair from a wrought iron blank previously prepared, slit and punched for the spike.

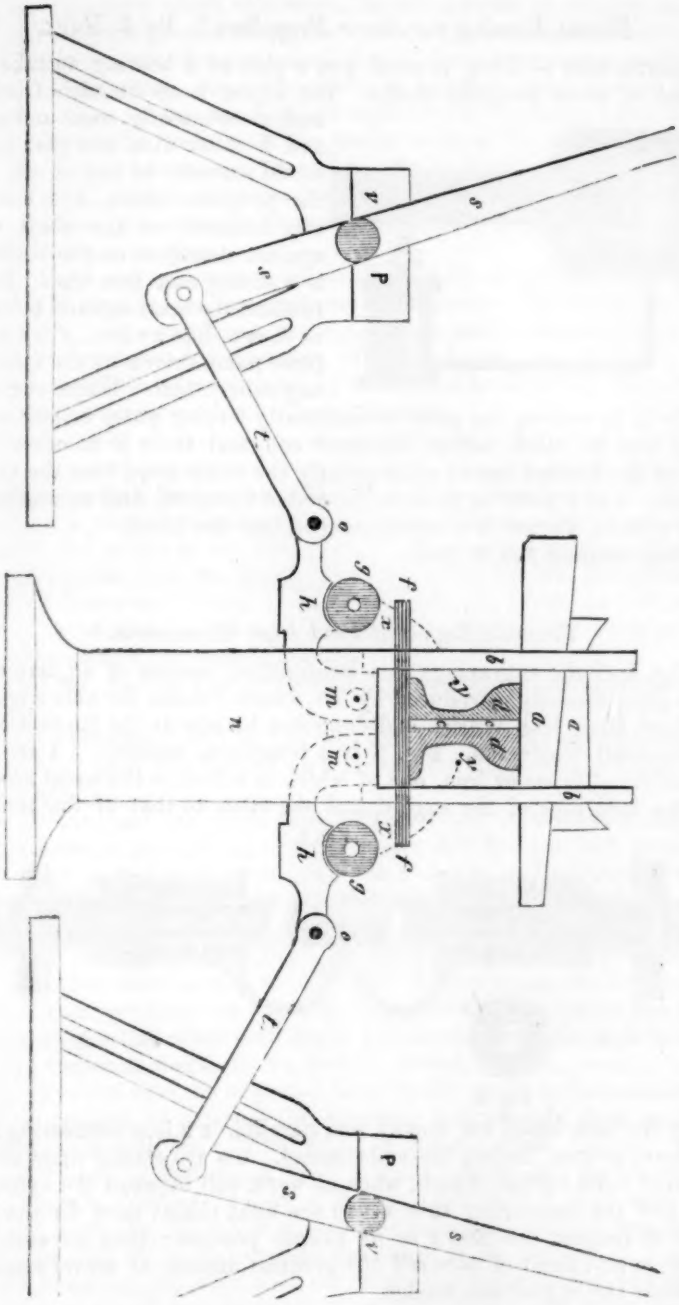
This press costs $60 only, and Colonel Hewson says:

"That with it, *two* men at a common smith's fire, can make 60 long chairs per day, and allowing for the coal used, the cost would be about four cents each, for turning.

"But if a heating oven is employed, *two* men can make 120 chairs per day, the cost in that case being little over two cents each. So that the difference in the cost of turning chairs by the hand press, or by the power machine, can in no event be serious.

"I have supposed herein, that the chair blanks will be punched for the spike holes, &c., at the mill, and am now obtaining blanks thus prepared (of $\frac{3}{8}$th plate,) in small quantities, at $80 per ton." M.

Description of the Cut.—Wrought iron keys, *a a*, are inserted through yokes, *b b*; they hold the rail *d d*, (or die,) which is divided longitudinally into two equal parts. *c c* being a wrought iron plate $\frac{3}{8}$ inch thick, which is drawn out to disengage the chair after it is turned, giving an allowance of $\frac{1}{4}$ inch for shrinkage; the rollers *g g*, move in the arc *x y;* they work in castings *h h*, which are the arms of the compound levers *h, t, s*, whose joints are at *m, o, s, v*, the arms *t t* are wrought iron; *s s* are levers 8 feet in length, P P are the stands for the levers—being the ordinary switch pedestals in use—*n* is the cast iron body of the press.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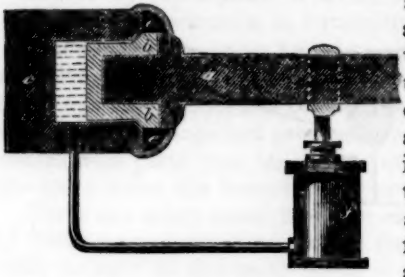
*Thrust Bearing for Screw Propellers.** By J. Hope.

Gentlemen :—I beg to send you a plan of a bearing to take the thrust of screw propeller shafts. The object is to diminish friction, and, consequently, wear and tear, and I think with this plan there would scarcely be any at all. *a* is the propeller shaft, *b* is a brass cap fastened on the shaft end, against shoulders on the shaft. *c* is a strong cast iron block, bored to admit the brass cap and beveled, as shown, like a valve. *f* is a small force pump driven by the same, or any other shaft. When the propeller is in motion, the pump is constantly forcing water or any other fluid into the block behind the shaft end, and there is no other vent but at the beveled faces; consequently the water must bear the entire thrust. *e* is a cover to prevent the water flying off, and to conduct it into vessels, whence it is again pumped into the block.



Bishop Auckland, Feb. 27, 1858.

Fenton's Improved Feed Pipe Connexions.†

Fig. 1 of the engravings is a longitudinal section of an improved feed pipe, recently introduced by Mr. James Fenton, the able engineer of Low Moor Iron Works, and described by him at the Institution of Mechanical Engineers. Fig. 2 is a transverse section. A A are two cylinders of brass or iron, one of which is bolted in the usual manner to the feed pipe of the engine, and the other to that of the tender;

Fig. 1.

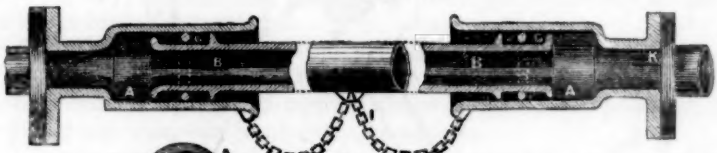


Fig. 2.

they are both bored out smooth and parallel. B B is a connecting tube of brass or iron, having the ends turned. G G are elastic rings of vulcanized india rubber, which, when at work, roll between the cylinders A A and the connecting tube B. I I are light chains used for the purpose of keeping the tube B in its proper position; they are each left slack to an extent of one-half the greatest amount of travel required between the engine and tender.

* From the Lond. Mech. Mag., March, 1858.

† From the Lond. Mech. Mag., Jan. 1858.

The advantages which this arrangement appears to possess are its extreme simplicity, and consequent cheapness both in first cost and current repair; and the great durability of the only wearing parts, the motion of the elastic rings when at work being a *rolling* instead of a *rubbing* action. Also, the absolute tightness of the joints when steam is blown from the boiler into the tender tank, as the elastic rings G G are then forced up against the collars on the tube B, for the purpose of enabling the rings again readily to adjust themselves to their proper position when the pressure is removed, which they do as soon as the engine is put in motion.

The india rubber rings G are made slightly larger than the space into which they fit, for the purpose of insuring a thoroughly watertight joint; the cylinders A are $3\frac{1}{16}$ inches inside diameter, and the tube B, 2 inches outside diameter, as in the figure; the ring is made $3\frac{1}{8}$ inches outside diameter, and $1\frac{7}{8}$ inches inside diameter, the section of the ring being a circle of $\frac{5}{8}$ inch diameter.

Should either of the tender valves get out of order on the journey, and it becomes necessary to stop the feed by other means, it is only requisite to slack back the bolts which hold the flanches together, and introduce a piece of sheet iron or zinc between them, of sufficient width to cover the orifice of the feed pipe. This simple and effectual mode of stopping the feed was suggested and adopted by Mr. Ramsbottom, of the London and North Western Railway, on which, as well as on several other lines of railway, this water connexion has been in successful operation for several months.

After Mr. Fenton's description was given at the above-named Institution,

Mr. Ramsbottom said he had had one of these coupling pipes in use rather more than two months on a locomotive, and it had worked very satisfactorily.

Mr. Craig had had one of them at work about three months, applied to a stationary force pump working under 300 lbs. per inch pressure, and it had proved quite successful. He had now applied them to several locomotives, and was well satisfied with the results.

Mr. T. Forsyth thought there was no doubt of the success of the plan with cold water, as shown in Kennedy's water metre; but he understood that when fixed near to a boiler for measuring the feed water, the india rubber ring was found to be injuriously affected by the heat; and he feared that when used much with steam blown through into the tender, the rings would not be found to stand.

Mr. Fenton said, he expected they would prove quite satisfactory in that respect, as some of the couplings had already been working three months with the original rings, in regular work, exposed to the ordinary blowing through of steam into the tender; and the rings were still at work, showing no sign of injury. But even if they were frequently worn out, the whole cost of maintenance would be very small, as it cost only 6*d.* each to renew the rings, or 2*s.* per set.

Mr. Siemens remarked that the vulcanized india rubber was manufactured at a high temperature, above 300° Fahr., and was not inju-

riously affected by exposure afterwards to a lower temperature; it proved very durable if its elasticity was not brought into action too severely, but a kneading action was very destructive, by breaking up the cohesion of the mass.

Professor RANKINE had used an india rubber ring to make a steam joint at as high a temperature as 550°, in a model where it was exposed to the steam at about 1000 lbs. per inch, and it had stood well if undisturbed; but when the joint had been several times broken, the india rubber was found to fail. India rubber suffered great injury also from the effect of oil, which caused its substance to become disintegrated or broken up.

The Chairman inquired what was the comparative cost of the new couplings and the ordinary brass ones.

Mr. FENTON replied, that their cost was £2 per set as compared with about £12 12*s.* for the brass ball and socket couplings, being only about one-sixth in first cost, and there was also a considerable saving in cost of maintenance. The rolling action to which the packing rings were subjected did not appear to be injurious to their material, as they had already run upwards of 8000 miles without any sign of injury, although exposed to the heat of blowing steam into the tender in the ordinary manner.

Description of the Hoisting Planes of the Mine Hill and Schuylkill Haven Railroad Company.

[Extracted from the Twenty-ninth Report of the Mine Hill and Sch. H. Railroad Company.]

The railway tracks upon each plane are quadruple, there being two tracks of heavy rails, laid of the usual width or gauge, for carrying the trains of cars, and two of narrower gauge, lying with the former, on which run the hoisting trucks. These narrow tracks terminate at the foot of each plane in pits, excavated between the rails of the wider tracks, deep enough to allow the hoisting trucks to run entirely below the passing trains. The hoisting action of the planes is reciprocating; a train of loaded cars going up on one track, while a train of empty cars goes down on the other; each of the tracks being alternately used for hoisting and lowering.

Propulsion is given to the ascending train, by the hoisting trucks, one of which stands when at rest in one of the pits at the foot of the plane, and the other on the opposite track at the head of the plane.

To the forward or upper end of each truck is attached the hoisting rope, a wire rope of great strength, which extends from the truck at the foot to the head of the plane, and there after passing around certain propelling drums to be presently described, is carried by a horizontal rendering sheave, eleven feet in diameter, to the opposite track, at the head of which stands the second hoisting truck, made like the first, narrow enough to run on the narrow gauge, entirely within the rails of the wider gauge track. To the hinder end of each of these hoisting trucks is attached a light wire rope called the tail rope, which

passes from the truck at the head to the foot of the plane, and at the latter point is carried around certain horizontal rendering and tightening sheaves placed in the pits before named, until it reaches the truck standing in the pit on the opposite track.

It will be seen that the rope is thus made continuous from the head to the foot of the plane and back again, forming an endless line, about two miles in length of circuit. This long line of rope is supported upon numerous small rollers, placed twenty feet apart along the centre line of each track, and is kept in a proper state of tension by heavy weights attached to the tightening sheave at the foot of the plane, where it has sufficient longitudinal play to counteract the casual variations in the length of the rope.

The hoisting rope receives its motion from two propelling drums, twelve and a half feet in diameter, situated a short distance beyond or above the head of the plane, and driven by a pair of stationary engines of four hundred horse power.

These drums are made of iron, and so constructed as to insure great strength, and most exact equality of circumference, and are connected by spur gearing, so as to revolve accurately together in opposite directions. To increase their steadiness, they are placed close enough to roll upon each other, up broad flanches or shrouding, turned true and raised on their peripheries, to the pitch circle of the gearing teeth. This shrouding serves the double purpose of steadying the revolving drums and strengthening the gearing.

Around these two drums the hoisting rope is carried, in a peculiar convolution, in the form of the figure 8, embracing nearly three-fourths the circumference of each drum, and crossed at their tangential line; this form of convolution being necessary to cause the oppositely revolving drums to concur in propelling the rope.

The surface of the peripheries, upon which the rope bears, is formed of a packing of short blocks of beech-wood, so fitted in their place as to present the end of the ligneous fibre to the action of the rope.

When the machinery is in action, hoisting an ordinary train of seven loaded cars, and lowering seven empty cars, the tension of the rope on the hoisting side is estimated to be equal to about nine tons, or twenty thousand pounds, and one-fourth as much on the side of the descending train; requiring a frictional adhesion, to prevent its slipping upon the peripheries of the drums, equal to the difference of these weights, say of not less than fifteen thousand pounds.

It may be worth while to record here, in passing, a practical datum appertaining to mechanical science, derived from the working of this hoisting apparatus.

During the past year, the whole number of cars, of all kinds, hoisted, was eighty thousand two hundred and ninety-two; weighing, with their contents, over five hundred and fifty thousand gross tons: an equal number of cars, mostly empty, weighing about two hundred thousand tons, were in the same time lowered. In doing this work, the hoisting rope traveled around the drums a distance of more than eleven thousand miles, requiring the drums to make one and a half million revolutions.

The effect of these one and a half million impressions of the wire rope upon the wooden packing on the peripheries of the drums has been to wear into it a groove, semi-circular in cross section, two inches wide and one inch deep, affording a remarkable proof of the resisting powers of wood, when properly applied.

It will be perceived that the arrangements are such as to avoid the necessity of attaching the trains of cars to the rope by temporary fastenings, an operation attended with both delay and danger.

All that is required is to run the train to be hoisted, up the foot of the plane far enough to pass the pit in which stands the hoisting truck, and to let the train that is to be lowered, run down the head of the opposite track, until it is stopped by the truck standing there.

As soon as these simultaneous acts are done, a telegraphic signal notifies the engine man, who immediately starts his engines, and puts the whole circuit of rope and the two hoisting trucks in motion: the one at the head of the plane moving down, followed by its train of empty cars, which now run by their own gravitation, being only restrained in their speed by the truck. The other truck rises out of its pit, until it strikes the hinder end of the upward loaded train, which it propels to the head of the line. Both trains reach the respective termini of the plane at the same moment, and, being free from any attachment to the rope, they immediately pass on with their acquired velocity; the one that was hoisted running on to a level track at the summit, whence it is taken by locomotive power, and the lowered one passing overhead of its truck—which is now in the pit—and running on a short piece of nearly level track to the head of the next plane, where it is caught by the truck waiting to receive it.

This alternate action is kept up continuously, with no longer interval of cessation than is required to allow the trains to pass to and fro out of each other's way.

The Report from which the foregoing description of the hoisting machinery is extracted, omits to state what part, if any, is claimed as original in plan or construction. On making inquiry upon this point, we learn that the Company lays no claim to originality or novelty of contrivance. But presents the whole as a judicious combination of various mechanical devices, nowhere else applied in similar combination, or upon so large a scale, the practical results of which are entirely satisfactory. EDITOR.

For the Journal of the Franklin Institute.

Steam and its Condensation. By THOMAS PROSSER, Civ. Eng., N. Y.

Having been permitted through the liberality of the publishing committee, to lay before the readers of this Journal* my peculiar views or theory, designated The "*Differential* System of Steam Power," and "*Hot Water* System of Condensation," it is with no small pleasure, that I again appear before its readers, to announce the complete success of its practical application, and to exhibit, by a diagram prepared for the purpose of elucidation merely, and therefore omitting all unnecessary detail, which would only tend to confusion, the modus ope-

* Vol. xxxi, 3d series, p. 343—vol. xxxiv, p. 199—vol. xxxv, p. 94, and vol. xxxvi, p. 4.

randi by which it is accomplished. More than this, I have shown by a mere schoolboy operation, how much heat enters the apparatus in the exhaust steam, and what becomes of it.

In following out these calculations, for the purpose of scrutinizing them with the utmost severity, which scrutiny I urgently invite, a reference may be had to the Tables at page 7 of this volume.

It may be thought that although the diagram, with its little *sum in addition*, is so a, b, c like, a small deviation therefrom in the temperature and pressure of the *exhaust steam* may upset the whole.

To show that this is not the case, I have prepared three *balance sheets* in *mercantile* form, with the exhaust steam ranging from 105° to 130° C., and corresponding with a back pressure upon the piston from a little above the atmosphere to twenty-five pounds to the square inch above it, without producing any derangement to its symmetry, and I will now add that, should circumstances require it, the back pressure upon the piston may be increased to the extent of the working pressure now usually applied, without any detriment or difficulty, and I am not quite sure that great economy of fuel will not be the result.

Be this as it may, I shall establish to the fullest extent, every claim which I have ever made for these systems. For *comprehensiveness* of range, whereby the back pressure and consequent temperature of the exhaust steam may be carried to any extent, so as to insure beyond the slightest doubt, an abundant supply of distilled water to recuperate that of the boiler, the "*hot water* system of condensation" has no rival. It is true that a separate vessel called an evaporator, is an adjunct to most, if not all of the patented condensers except mine, but they are delusions, one and all, and exist only on paper; they are nowhere in use, for the very simple reason that they are entirely useless—complete abortions—the best of them resolving itself into a boiler.

This is the POINT to be attained, *a recuperative supply of pure water to make up for the boiler waste*, compared with which, all other considerations sink into insignificance. Bearing *this* in mind, I now invite attention to the diagram Plate I*—where it will be seen that there is an entirely free exhaust for the steam through the bottom of the "heater condenser" *cistern*, into the "main condenser," where even the steam is still hot enough to boil the water which surrounds it, so little is its temperature reduced by the heater, in consequence of the water therein having entered it at so high a temperature. Of the "100 lbs." of steam entering and containing "63850° C." of heat, it is calculated that as much of the latter may be transferred into the "hot water" as will evaporate "40 lbs." of it, and thus form secondary steam, (or "vapor" by way of distinction,) all of which may be forced by its own elasticity over into the "still condenser," of which "30 lbs." may escape as vapor, while "10 lbs." become condensed, and by means of a small transfer pump, is united to the "100 lbs. of water," ("condensed steam") from the "main condenser," and both together are pumped through the "heater" into the boiler. While this is going on, the hot condensing water is being forced up the pipe and away to waste. Now

* And also to the balance sheet No. 1, which corresponds with it.

observe, it is the height which the vapor has to lift this column of water before it can escape, which regulates the temperature, and of course, the back pressure of the exhaust steam upon the piston, as well as the temperature of the feed water.

The exact manner in which the escape of the "waste hot water" and of the "vapor," maintain an equilibrium, is not a little singular, viewed through the medium of a glass gauge on the outside of the cistern. If the water is not hot enough to form vapor of the requisite tension, the vapor alone will escape, but on that very account it will necessarily be very slow, much slower than the accumulation of heat in the "hot water," in consequence of which, an equilibrium is almost immediately re-established after any interruption, and the "hot water" flows one way, and the "vapor" another, in exact mathematical proportions, variable at pleasure, by the operator.

It will be observed, that nearly all the air which separates from the condensing water, is compelled to escape with the "vapor," and find its way into one of the "reservoirs" below. A portion of it will be united to the condensed vapor, and with it will be pumped into the other "reservoir," from which it can only escape with the feed water into the boiler.

This is important, if, as many suppose, the most terrific explosions arise from a deficiency of air in the boiler water.

The "*tell-tale*" character of this condenser is not to be overlooked, for with the glass gauge and seven cocks, a child may be taught to tell whether the apparatus is working properly or not. Without going into unnecessary detail, the reader will readily see that the following questions admit of instant reply.

Is the supply of condensing water sufficient?

Look at the glass gauge, and if the water is visible, the answer is yes.

How much distilled water are the "main" and "still" condensers producing?

Turn two cocks connected with a cup in the reservoir, which catches the water as it descends, and conveys it outside through the cocks.

Are the feed and transferring pumps effective?

Open the two pet cocks in the reservoirs; if no water comes, the pumps are taking it all.

Does the "heater" condenser leak?

Take out the check valve, but replace its cap, and then let on the boiler pressure, and open the cock in the cistern.

Do the "main" or the "still" condensers leak?

Open the two cocks before referred to.

NOTE.—The three last operations require that the engine be stopped.

Is there any mud in either the "main" or condenser cisterns?

Open the cocks and see.

I am not aware of any other question to which an answer can possibly be required, as necessary to a proper knowledge of the working of the condenser, and therefore I claim for it a simplicity which has never before been attained by any condenser whatever, having the same objects in view, for, with the exception of a very simple contrivance called

the "regulator," which controls the quantity of water allowed to enter the main condenser cistern, there is no mechanism to get out of order. There are three pumps, the largest of which need not be more than double the area of the ordinary feed pump of a condensing engine; that is the cold water pump; the feed pump may deliver one-fourth, and the transfer pump one-sixteenth as much. No air pump is required, and therefore we have the simplest of all steam engines, the ordinary high pressure one.

In calculating the first cost of this condenser, it should be remembered that it occupies the place of air pumps, condenser, heater, and distilling apparatus, the latter being inevitably a whole boiler and still, to be of any service. The small space occupied by my apparatus in comparison with the incumbrances removed, is of no small importance. Add to this the reduction of the boilers to at least one-half their present dimensions, with a corresponding reduction in the consumption of fuel, and we have the cheapest condensing apparatus ever known, and one which, from the experience of eighteen months in salt water, and the worst possible kind of usage, there is every reason to believe will last *ten years* if not more, in salt water, which is more than three times as long as any now known are pretended to last.

The copper tubes in the condensers of the "*Arago*," were worn out in less than two years. Those in the "*Keystone State*," according to Mr. W. Jones, in this *Journal*,* gave out in an incredible short time, the vessel only "*having run several thousand miles.*" If, however, as Mr. Jones says, they (the tubes) "were in use for a considerable time," the vessel must be a remarkably slow one. The idea of tinning "upon the inside and outside" is certainly amusing, for if the copper withstood the action of the torrent of condensing water but one month, it can scarcely be possible that the tin will remain for a single day. But if it does remain, what then? What effect will it have upon condensation? Copper being one of the best and tin one of the worst conductors of heat. That "sea water has no action upon pure copper," is a great mistake on the part of Mr. J.

The "*Fulton*" fared no better as regards her condenser tubes, which are also of copper, while those of her boiler were of brass, which have been removed and replaced with iron ones after two years' use.

The boiler tubes of the Collins line of steamers, were all of iron originally, but after a few years were replaced with brass, but again, iron gained the precedency in the "*Adriatic.*" The average life of the iron tubes did not exceed two years and a half. The average cost of each new tube, and of the labor and use of tools for substituting it for the one removed, were about equal, but the cost for scaling was not less than double that amount, so that every tube really cost four times its original value, before it had disappeared and was replaced. The actual cost of iron tubes, including the cost of cleaning them, has not been less than ten dollars per annum per horse power, while the cost of fuel, together with all its concomitants of boiler and firemen, is not less than twenty times as much, making two hundred and ten dollars ($210) per

* Vol. xxxv, 3d series, p. 414.

annum per H. P., of which one-half may be saved; and one-half of that will pay for a condenser that will do it for ten years without costing as much for repairs as an ordinary one.

It must be borne in mind that the tubes usually commence to give out on the first voyage, and continue to give out in an accelerated ratio until at the expiration of five years all the original tubes are calculated to have disappeared. If, therefore, some of them will last for *more* than five years, under such unfavorable circumstances as they are placed in, that is to say, in a boiler where the heat is intense and unequal, and the point of saturation of the water at which deposition takes place is often arrived at, how long may they be expected to last where the very reverse of these unfavorable circumstances occur? where, in fact, the temperature is moderate and equal, and where the point of saturation of the water at which deposition takes place, never can be arrived at.

These considerations and many others, have convinced me that iron alone should be used both for boilers and condensers of sea-going steamers, as well as for all others, and that the saving which the use of my condenser will effect, is far beyond anything that I have stated.

I have spent a fortune and many years of my life in perfecting it, and having *succeeded*, I am surely entitled to a trial, or to evoke the engineering talent of the country to prove that I have not.

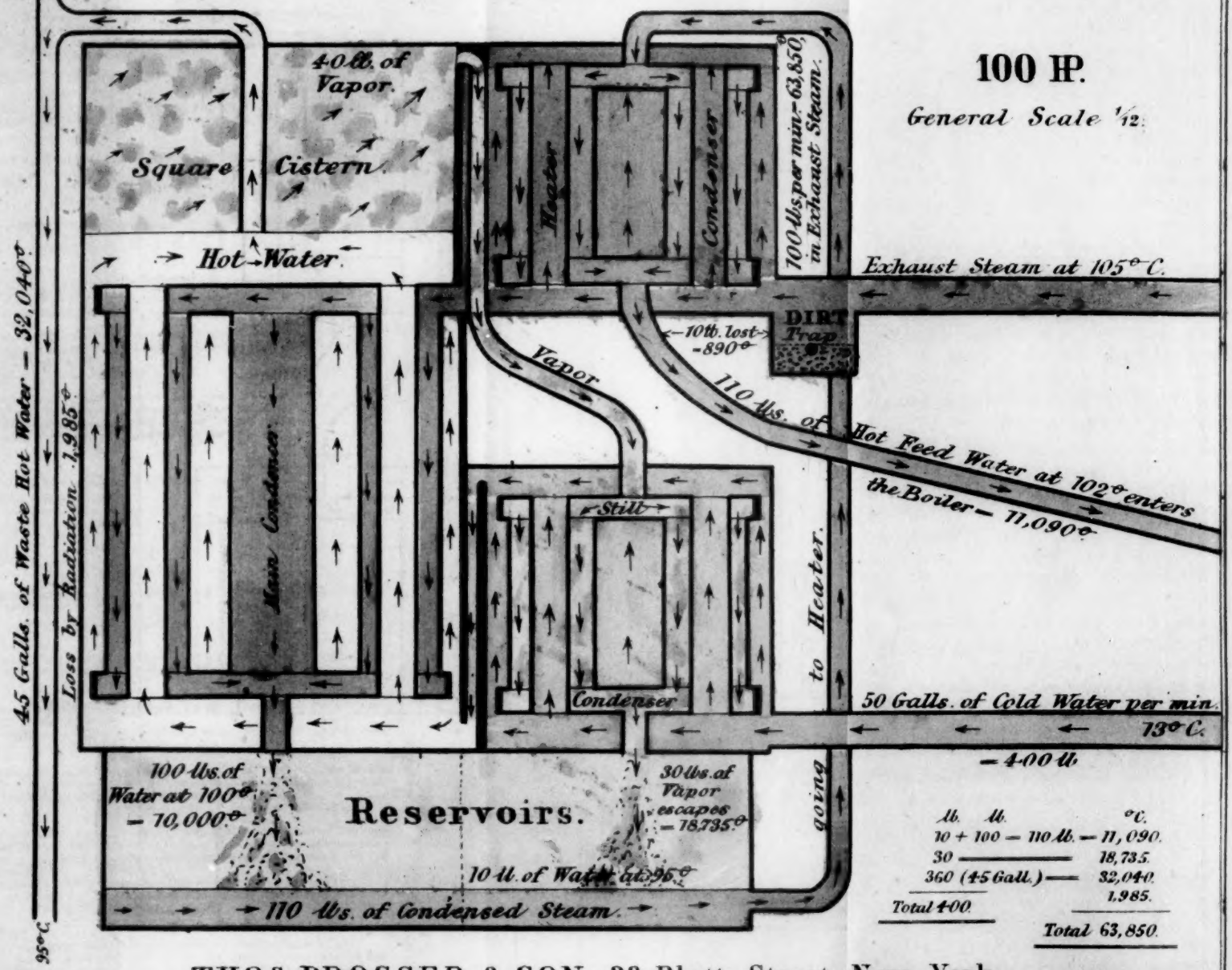
TABLE No. 1.—*Account current of one hundred horse power Steam Engine Condensers, for one minute.*

DR.	Temp.	Weight.		Total heat.	Total heat.
	°C.	lbs.	@	°C.	°C.*
To total heat in exhaust *steam* entering the cistern of Heater Condenser, at a temperature of	105				
Weight,		100	×	638·5	63850
CR.					
By total heat in condensed exhaust steam (feed-water) departing from the Heater Condenser (for the boiler,) at a temperature of	102				
Weight,		100	×	102	10200
By acquired heat in distilled *water*, departing as above, and at the same temperature of	102				
Being a portion of the condensing water which entered the cistern of the Distilling Condenser, at a temperature of	13				
Became vaporized in the main cistern, and entering the Distilling Condenser was therein condensed, and then pumped up through the Heater Condenser, having acquired	89				
Weight.		10	×	89	890
NOTE.—The above two items make 110 lbs. of feed-water entering the boiler at 102°C., but the 10 lbs. is allowed for loss between leaving the Heater Condenser, and returning as exhaust steam into its cistern.					
By acquired heat in condensing *water* departing from the main cistern, at	102†				
In 45 galls. of waste hot water which first entered the Distilling Cistern, at	13				
Weight,		360	×	89	32040
By total acquired heat in *vapor*, departing via the chimney, at	102			637·5	
From the main cistern direct, or after having passed through the distilling condenser, uncondensed, being a portion of the condensing water which entered the distilling cistern, at				13	
Weight,		30	×	624·5	18735
NOTE.—Condensing water 50 gallons, weight,		400			
By Flotsam and Jetsam, (radiation and leakage,) may be					1985
Equivalent to 22 lbs. more of condensing water.					63850

* Erratum, to Merchants only, for °C. read dollars. † Erroneously marked 95° C., in Plate I.

PROSSER'S CONDENSERS EXEMPLIFIED.

Patented Dec. 15th 1857.



THOS PROSSER & SON, 28 Platt Street, New-York.

May 22nd 1858.

Lith. by Geo. Hayward, 120 Water St. N.Y.

64610

TABLE No. 2.

Dr.	Temp.	Weight.		Total heat.	Total heat.
	°C.	lbs.	@	°C.	°C.
To total heat in exhaust *steam* entering the cistern of Heater Condenser, at a temperature of . . .	110				
Weight,		100	×	640	64000
Cr.					
By total heat in condensed exhaust steam (feed-water) departing from the Heater Condenser (for the boiler,) at a temperature of	105				
Weight,		100	×	105	10500
By acquired heat in distilled *water*, departing as above, and at the same temperature of	105				
Being a portion of the condensing water which entered the cistern of the Distilling Condenser, at a temperature of .	13				
Became vaporized in the main cistern, and entering the Distilling Condenser was therein condensed, and then pumped up through the Heater Condenser, having acquired	92				
Weight,		10	×	92	920
NOTE.—The above two items make 110 lbs. of feed-water entering the boiler at 105° C., but the 10 lbs. is allowed for loss between leaving the Heater Condenser, and returning as exhaust steam into its cistern.					
By acquired heat in *water* departing from the main cistern, at	105				
In 45 gallons of waste hot water which first entered the Distilling Cistern, at	13				
Weight,		300	×	92	33120
By total acquired heat in *vapor*, departing via the chimney, at .	105			638·5	
From the main cistern direct, or after having passed through the Distilling Condenser, uncondensed, being a portion of the condensing water which entered the Distilling Cistern, at .				13	
Weight,		30	×	625·5	18765
NOTE.—Condensing water 50 gallons, weight, . .		400			
By Flotsam and Jetsam.					
(radiation and leakage,) may be . .					695
Equivalent to 6 lbs. more of condensing water.					
					64000

TABLE No. 3.

Dr.	°C.	lbs.	@	°C.	°C.
To total heat in exhaust *steam* entering the cistern of Heater Condenser, at a temperature of . . .	130				
Weight,		100	×	646·1	64610
Cr.					
By total heat in condensed exhaust steam (feed-water) departing from the Heater Condenser (for the boiler,) at a temperature of	120				
Weight,		100	×	120	12000
By acquired heat in distilled *water*, departing as above, and at the same temperature of	120				
Being a portion of the condensing water which entered the cistern of the Distilling Condenser, at a temperature of .	13				
Became vaporized in the main cistern, and entering the Distilling Condenser was therein condensed, and then pumped up through the Heater Condenser, having acquired .	107				
Weight,		10	×	107	1070
NOTE.—The above two items make 116 lbs. of feed-water entering the boiler at 120° C., but the 10 lbs. is allowed for loss between leaving the Heater Condenser, and returning as exhaust steam into its cistern.					
By acquired heat in *water* departing from the main cistern, at	120				
In 45 gallons of waste hot water which first entered the Distilling Cistern, at	13				
Weight,		360	×	107	38520
By total acquired heat in *vapor*, departing via the chimney, at,	120			643·1	
From the main cistern direct, or after having passed through the Distilling Condenser, uncondensed, being a portion of the condensing water which entered the Distilling Cistern, at .				13	
Weight,		30	×	630·1	18903
NOTE.—Condensing water 50 gallons, weight, . .		400			
					70493
Being equivalent to 55 lbs. too much of condensing water.					5883
					64610

*On an Apparatus for the Prevention of Smoke in Steam Boiler and other Furnaces.** By Mr. William B. Johnson.

Although it is generally admitted by those using steam boilers, that introducing cold air for the prevention of smoke may be made to effect that object, yet there is a general impression that this is effected only at the expense of a loss in the consumption of fuel. The object of the present paper is to show that smoke from steam boiler and other furnaces may be prevented with an economy in fuel, instead of causing a loss; and the experiments made by the writer, described in the present paper, appear to prove satisfactorily that, by judicious arrangement, cold air may be admitted into the furnace, so as effectually to prevent the production of smoke, and at the same time cause the gases given out from the furnace to produce a more intense heat in their combustion, and to that extent economize the consumption of fuel.

The air, to be most effectual for the prevention of smoke, should be admitted in such a position relative to the furnace as to cause the whole of the products of combustion to come under its influence; and it should be admitted also in such increased or diminished quantities as the varying amount of gases produced may require.

The boiler to which the apparatus described in this paper is applied is of the multitubular construction, a form that presents more difficulty to the prevention of smoke than the various kinds of flue boilers. This boiler is of 30 nominal horse power. The shell is 6 feet diameter by 14 feet long; the furnace is 2 feet 10½ inches diameter by 12 feet long, and is attached to the fire chamber, 1 foot 7 inches long; there are 35 tubes, 3¼ inches diameter, leading from this chamber. The fire-grate is 7 feet long, and the top of the bridge is 9 inches from the top of the furnace, and is level across the top.

Between the shell of the boiler and the top of the furnace is fixed a vertical wrought iron tube, 7 inches diameter inside; this is placed directly over the furnace bridge, and through it air is admitted to act upon the products of combustion passing from the furnace over the bridge. On this tube is placed a self-acting apparatus, by which the admission of air is regulated. It consists of an outer casing, which surrounds a cylinder containing water, leaving an annular space, down which air passes to the tube. Projecting upwards from the centre of the cylinder is a guide rod, which receives a floating cylindrical chamber, closed at the top by a plate, which forms a valve cover to the annular air spaces. An opening is made in this plate, to receive a regulating valve, by which air is allowed to escape from the floating chamber, and thereby diminish its buoyancy.

The action of the apparatus is as follows:—When the furnace door is opened for firing, a chain, attached to it and passing over pulleys to a bell-crank lever connected to the cover of the valve, lifts it, together with the air chamber, above the surface of the water contained in the cylinder. When the furnace door is shut, the valve cover falls, until the air retained in the air chamber causes it to float upon the water, in

*From Newton's London Journal, April, 1858.

which position air is allowed to pass down to the furnace. The regulating valve is adjusted by means of a small screw, so that the valve cover may close or rest upon its seat in 5 or 10 minutes time, more or less, as may be required by the mode of firing adopted, and thus stop the supply of air to the furnace.

The advantages of this apparatus are considered to be, that the air, being admitted in a downward direction, does not beat the flame against the furnace plates and injure them, as is the case when it is admitted in an upward direction. The opening for admitting air cannot be choked up with dust or ashes from the furnace. Air is admitted at a part where the whole of the products of combustion are compelled to pass, and where they are most concentrated. The supply of air gradually diminishes from the time of firing, and ceases altogether when the supply obtained through the fire-grate is sufficient to produce complete combustion. The furnace fittings are as simple as those of an ordinary furnace, and therefore are not more liable to get out of order. The self-acting valve for admitting air is simple in construction, no packings or accurate surface fitting being required; and the apparatus is worked by the fireman without any extra duty whatever beyond that required for an ordinary furnace.

The results of the experiments made with this apparatus applied to the boiler described, have proved that smoke was effectually prevented by its use. During the experiments the process of combustion of the gases was observed through an opening made in the back chamber; and it was found that, immediately after firing, a dense black smoke was produced if the valve was closed, which was instantly replaced by a light white flame when the valve was opened, and so continued as long as the valve was opened to its proper extent; but if closed too soon, as was frequently done for experiment, dense black smoke was again produced. Similar results were observed at the chimney top, except that the transition from dense smoke to no smoke was not so instantaneous as in the chamber, on account of the length of flues to be traversed before reaching the chimney top.

A pyrometer has been attached to the boiler, for the purpose of ascertaining whether the use of this smoke-prevention apparatus was attended with an increased production of heat; and numerous experiments made with it confirm the view that a proper supply of cold air is attended with considerable increase of temperature, particularly immediately after the furnace is supplied with fuel.

—

Mr. Johnson showed the pyrometer that had been used in the experiments, with the regulating cylinder at work, and explained their action. He observed, that the general fear of proprietors of steam boilers that smoke prevention involved a waste of fuel caused a great impediment to the carrying out of smoke burning; and the present apparatus had been devised to meet this difficulty, since waste of fuel was not a necessary accompaniment of the principle, but simply showed a defect in the mode of carrying it out. The object of the pyrometer was to test more fully the result of the apparatus in economizing fuel. The alter-

nate experiments of opening and shutting the air valve always showed a rise of temperature after firing whilst the valve was open, which appeared conclusive evidence of improvement in the employment of the fuel, more heat being generated by the consumption of the same fuel, in consequence of its more perfect combustion.

The CHAIRMAN said, he believed it was generally admitted that the additional supply of air to consume the smoke could be introduced without loss of temperature if properly regulated; but the difficulty was to make the apparatus self-acting, and to insure it from getting out of order. The object might be effected without apparatus, by sufficient care in firing; but it was impracticable to obtain the constant care requisite on the part of the men. The plan described appeared to be well contrived for the purpose, from its simplicity of construction and working, and the principle of action was certainly a good one; it was similar to that of a plan described at a former meeting by one of their members, in which the air was admitted through a regulating apparatus in the fire-door.

Proc. Inst. Mech. Engineers, London.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM APRIL 27 TO MAY 25, 1858, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

APRIL 27.

258. MACHINE FOR WETTING PAPER; John A. Lynch, Boston, Massachusetts.

Claim—The combination of the wetting cylinder, handle, and roller, the whole constituting a new implement or machine by which the sheet on which the impression is to be taken can be dampened, and its superfluous moisture absorbed by passing the apparatus once over the sheet.

259. HARVESTERS; J. B. McCormick, Versailles, Kentucky.

Claim—The separator formed of the bar and rods, in combination with the adjustable rod, bars, one or more seat and reel, provided with concave beaters when the several parts are constructed.

260. PREPARING STEREOTYPE PLATES; John McElheran, Brooklyn, New York.

Claim—Producing a plate of fixed metallic types for printing from, by stamping letter dies in succession to each other into a plate made of, or coated with, such a substance as will readily take and preserve their impressions, and allow a stereotype or electrotype to be made thereof, either directly or by means of an intermediate plaster cast, whereby the ordinary process of setting and distributing the type is dispensed with, and but one set of types is used.

261. METALLIC SHOE FOR TRUSS BRIDGES; David H. Morrison, Dayton, Ohio.

Claim—The combination of metallic shoes or angle pieces with several parts of wooden trusses, in such manner that the cuts or gains made in the timbers of the trusses, against which the bearing surfaces on the shoe rest, are at right angles, or nearly so, to the fibres of the timbers, for the purpose of preventing the injurious effects of shrinkage, there being on every shoe at least three such bearing surfaces, one each for the chord, post, and brace.

262. MILL-STONE DRESS; Gabriel Natcher, Indianapolis, Indiana.

Claim—1st, The lines upon the upper portion of the inclined plane of the furrow. 2d, The curved or retarding lines upon the breast circle. 3d, The parallel or uniform lines upon the whole surface, running straight or at any desired curve. 4th, The combination and arrangement of the various parts making up the complete dress of the mill-stone.

263. MILL-STONE DRESS; Gabriel Natcher, Indianapolis, Indiana.

Claim—The application of the diamond in the production of the small lines in any required form upon the face of mill-stones for dressing the same.

264. METAL AWNING; Wm. C. Parisen, City of New York.

Claim—The metal plates or strips, so arranged that one may overlap the other, and be kept in proper position by guides, when said plates are used in connexion with toggles and arms, and a windlass, arranged so as to raise and lower, or fold and unfold the plates.

265. COTTON GINS; S. R. Parkhurst, City of New York.

Claim—The manner of connecting a ginning or card cylinder with a stripper, by combining with said cylinder and stripper the internal gear and pinion.

266. ENVELOPES FOR LETTERS, &c.; Charles Phelps, Salem, Massachusetts.

Claim—The application to a letter envelope of an opener therefor, said opener to be attached to, and part of, said envelope.

267. Convertible Extension Table; Michael Quigley, Watertown, Wisconsin.

Claim—Securing the leaf A, to the legs, and leaf E, for the purpose of performing an extension table, the leaves of which are folded in a perpendicular position. Also, the arrangement of the case as constructed with the inclined brackets, for the purpose of completing the bed of the table when required.

268. Churn; G. S. Rarey, Columbus, Ohio.

Claim—Operating or giving the dasher a reciprocating rectilinear motion from the driving rotary wheel, through the medium of the pinion, crank pulley, connecting rod, segment, and rack bar.

269. Printing Press; Thomas S. Reynolds, Athens, Georgia.

Claim—1st, The rotating segment, in combination with the intermittingly rocking bed, the segment having a continuous rotary movement while the bed rocks to and from the segment, and remaining, while in a vertical or nearly vertical position, stationary a sufficient length of time to have the form properly inked. 2d, The inking device formed of the fountain and the roller, operated by the cams, levers, bar, and the frame, with the weight and cam arranged to operate conjointly with the segment and bed, so that the form will be properly inked during the "dwell" or the cessation of the movement of the bed. 3d, The counterpoises, when used in connexion with the springs, whereby the counterpoises may be graduated as circumstances may require. 4th, The frame attached to the shaft, which is fitted in the bars, and having the spring and rod attached.

270. Fly Trap; William Riley, Madison County, Mississippi.

Claim—The shape of the trap, the sliding drawer, the manner in which the triggers are made, the tube which prevents the flies from returning from the bag to the box, the bag and circle by which the flies are destroyed, by detaching the bag and circle from the box, and the glass on the back part of the box introduced to give light, and lead the flies away from the place of entrance to the bag.

271. Bedstead Rail; Charles Robinson, Cambridgeport, Massachusetts.

Claim—An elastic support bedstead rail, composed of the notched rail piece, stretched elastic band, and confining or cap strip.

272. Apparatus for Raising Leather from Vats; C. E. Robinson and L. D. Sanborn, Concord, N. H.

Claim—The manner of taking leather out of tan vats, by using hooks or a movable frame with copper rods, to be placed in the bottom of each vat before the leather is placed therein, or any way similar to the same, by which all of the leather and bark can be taken out at one time.

273. Steam Valve; Thomas Scott, San Francisco, California.

Claim—The reciprocating or revolving valve, whereby the steam enters at or near the axial centre of the valve, and is then conveyed obliquely through the valve to the cylinder, the valve and hollow stem united and acting as a rock shaft or centre.

274. Constructing Coffins; Isaac C. Shuler, Amsterdam, New York.

Claim—1st, The combination of the self-securing frame with the catch on the false head-piece, operated by the spring as a cover over the joints, after soldering the top of a metal coffin. 2d, The arrangement of placing inside of a metal coffin, near the upper edge of the walls, the iron frame, or its equivalent, fastening it securely, for the purpose of shaping permanently the upper part of the body of the coffin exactly like the braded frame at the bottom, and as a means of securing a close joint on the top for soldering the same to the walls of the coffin; also, for the purpose of supporting the top on a line sunk somewhat below the upper edge, sufficient to leave an extension or projection of the metal all around the upper edge of the walls above the coffin top, when fixed in its proper place. This extension of the metal which shows itself above the frame, is made expressly for the purpose of soldering on the coffin top without using the lap or lock joint. 3d, The false head piece and the spring, or its equivalent.

275. Paddle Wheel; Nathan Smith, Berwick, Louisiana.

Claim—1st, The fitting of the two paddle hubs with their arms to the shaft, and the attachments of the buckets to the arms, in such a manner that either hub may be permitted at pleasure to be turned upon the shaft by the pressure of the buckets upon the water, for the purpose of adjusting the buckets obliquely in either direction to the shaft, and of returning them to a position parallel with the shaft. 2d, The employment of the bolts and a system of levers and sliding collars, in combination with the loose paddle hubs and fast hubs, with their corresponding holes, for the purpose of liberating the hubs from, and securing them to, the shaft, to permit and secure the adjustment of the buckets.

276. Bedstead; Noah W. Speers, Cincinnati, Ohio.

Claim—1st, The bent posts, in combination with the clamp, or substantially equivalent device, by which they are connected at top. 2d, The outside inclining rail for supporting the posts and fastening the various parts together. 3d, The construction and arrangement of the corner fastening, in connexion with the rails and posts.

277. Leather Slicker; H. Lee Sultzbach, Marietta, Pennsylvania.

Claim—The arrangement of the bolt with the blade, operated by the knob, spring, or its equivalent.

278. Washing Machine; Charles M. Swany, Richmond, Indiana.

Claim—1st, Such a construction and arrangement of the disk and rubber case with the tub, that the disk and rubber case are free to move in opposite directions simultaneously. 2d, The manner of arranging the rubbers or ribs upon the horizontal rubbing surfaces of the disk and rubber case, for the purpose of keeping the clothes in place during the process of washing.

279. Drawer for Closets, Bureaus, &c.; Henry R Taylor, Roxbury, Massachusetts.

Claim—The sliding pieces, or their equivalents, connected with the drawer.

280. Washing Machine; Edmund Tharp, Cincinnati, Ohio.

Claim—The arrangement and combination of the vertical rotating disk and quarter spherical trough.

281. Mill for Grinding Paint; Chauncy Thomas, West Newbury, Massachusetts.

Claim—The combination of the force (or its equivalent,) with the grinder or mill for grinding paint. Also, the mode of combining the piston with the mechanism or means of elevating and depressing it, that is to say, by such a mechanical device or devices as will not only allow the piston to be elevated out of the pump, but swing laterally out of the way or beyond the mouth of the pump, when receiving the material to be ground.

282. Straw Cutters; John Tittle, Johnstown, Pennsylvania.

Claim—The arrangement of the knife with its arms or levers, when connected for operation conjointly

with the feed rollers, pressure bar, and feed box. Also, in combination with the lever, pawl, bar, and curved portion, the sliding bar.

283. SMUT AND GRAIN CLEANING MACHINE; Jeremiah Tobin, Newark, New Jersey.

Claim—1st, The blast passage formed by the cylinder and case, in connexion with the rotary basin, or an equivalent device, for the purpose of properly presenting the grain to the action of the blast in said passage. 2d, The screw, fan, blast passage, cylinder, and case.

284. FRAMES OR CAISSONS OF BREAKWATERS, &c.; Edward H. Tracy, Brookiyn, New York.

Claim—Constructing the frames of breakwaters with longitudinal compartments, two or more, the inner compartment or compartments being provided with a flooring or bottom, and the outer compartment being open at its lower end.

285. WARM AIR REGISTERS AND VENTILATORS; Edward A. Tuttle, Brooklyn, New York.

Claim—A warm air register, viz: the frame having lugs and recesses, the end piece provided with lugs for the reception of screw, the ledge or step and openings for the leaves, when combined with a mechanism for operating the leaves.

286. BRICK MACHINE; Stephen Ustick, Philadelphia, Pennsylvania.

Claim—1st, The combination and arrangement of the filling box, scraper, and guides, or their equivalents, as an improvement on the filling box, in the machine for which Letters Patent were granted to me, September 8, 1857. 2d, The piston and plunger, the plunger being operated by the spring, or its equivalent. 3d, The grooves in the facing of the piston, and the grooves in the facing of the plunger. 4th, The curved piece, in combination with the segmental piece and pin.

287. MACHINERY FOR SUPPLYING TENDERS WITH WATER AT RAILROAD STATIONS; Benjamin M. Van Derveer, Clyde, New York.

Claim—The application of the pipes to water-houses of railroad stations, or to any other place for the same purpose. Also, the combination of these pipe heads and pipes, acting upon one box or nipple.

288. BRICK MACHINE; I. Z. A. Wagner, Philadelphia, Pennsylvania.

Claim—1st, Moulding and pressing bricks by means of the two rotating wheels, and hopper, or its equivalent, the wheels having their peripheries notched or recessed. 2d, Having the hopper formed of two parts, in connexion with the plates, so that the sides of the hopper and the plates may be adjusted to the wheels to prevent the escape of clay between their ends and the sides of the hopper and plates. 3d, The pin, operated from the wheel by the rod, with its wedge and spring, where said pin is used in connexion with the moulding and pressing wheels and hopper, or its equivalent.

289. APPARATUS FOR GENERATING CARBONIC ACID GAS; Thomas Warker, City of New York.

Claim—The bottle and chamber, connected together and provided with the ball valve, so that communication is obtained between the chamber and bottle by the tilting or inclining of the same, when these parts are combined with, and applied to, the receiver.

290. APPARATUS FOR DAMPING PAPER; C. A. Waterburg, City of New York.

Claim—1st, The application of one or more tablets when kept in a wet state, for the purpose of taking copies of written letters, and other documents. 2d, The use of wood, or other substances, when used in copying tablets. 3d, The use of the case, or substitute, which contains the water tablets, when used in connexion.

291. FOLDING MATTRESS; William Wells, Harrisburgh, Pennsylvania.

Claim—The inclined seats of the hinge, on which seats the hinge is fastened, for the purpose of folding the mattress.

292. WASHING BOTTLES; Wm. B. White and John Whitford, Saratoga Springs, New York.

Claim—1st, The series of devices, including the pulleys, the clutches, the collar, the radial arms, the springs, and the grippers, whereby the bottle is rotated in one direction, while the chain or brush, or other devices for cleansing the inside of the bottle, is rotated in the other. 2d, The use of a cam (like that of a pocket knife blade) on the hinged end of the rod, whereby the same tends to remain in a line continuous with the main spindle, or at right angles, or any other given angle thereto. 3d, The use of the spring on the bar, so as to adapt the same to different depths of bottles.

293. FIRE-BOX OF LOCOMOTIVE ENGINE BOILERS; Ross Winans, Baltimore, Maryland.

Claim—The combination of a fire-box having one grate and an upper and lower feeding door, so arranged as to adapt it to burning either wood or coal, or a mixture of both, as fuel, with a locomotive tubular boiler having a steam blast draft.

294 FIRE-BOX OF LOCOMOTIVE BOILERS; Ross Winans, Baltimore, Maryland.

Claim—The construction of the fire-box in such manner that its entire rear side can be opened and closed.

295. BOILERS FOR LOCOMOTIVE ENGINES; Ross Winans, Baltimore, Maryland.

The chief object of my improvement is to adapt the locomotive to the burning of coal as a fuel, without impairing its efficiency in other respects.

Claim—The method of constructing the fire-boxes of locomotive engines of diminished weight, but of undiminished strength, by staying the crown sheet directly to the exterior shell, by means of through bolts, and contracting the space between the two, so as to get rid of the disadvantages that would result from the excessive weight of a fire-box of the ordinary construction, of sufficient capacity to burn coal as fuel with economy.

296. FURNACES OF LOCOMOTIVE BOILERS; Ross Winans, Baltimore, Maryland.

Claim—The construction and arrangement of the locomotive engine, so as to obtain a fire-box of greater width than the space within the main frame.

297. MAKING METALLIC NUTS; S. W. Wood, Washington City, D. C.

Claim—A solid female die with a sliding hook for discharging the finished nuts.

298. RAKING AND DELIVERING ATTACHMENT TO HARVESTERS; W. A. Wood, Hoosick Falls, New York.

Claim—1st, Giving the rake its reciprocating, and rising, and falling motion, by means of a single traveling belt or chain without any other appliances. 2d, In combination with a uniformly moving antomatic rake, a delivering apparatus, which is set in motion by the conductor, and butts off the gavel, and returns for the next succeeding operation.

299. COTTON GINS; James N. Wilson and George W. Payne, Memphis, Tennessee.

Claim—The adjustable hinged hopper and rib frame, in combination with the belt arrangement, by which

the side frame can be adjusted, raised, or lowered without stopping the motion of the machine. Also, the projections on the ribs. Also, the toothed feeding cylinder, in combination with the inclined grate partition and hinged cover.

300. CORN AND COB MILL; Benjamin Winter, Buckingham C. H., Virginia.

Claim—The combination of the adjustable bridge tree, rollers, inclined planes on the base of the revolving cone, and horizontal stepped disks, for action together.

301. GANG PLOUGHS; G. W. N. Yost, Cincinnati, Ohio.

Claim—1st, The torsion spring, in combination with the plough share, for the purpose of allowing a single share to swing backward in passing stones, and then automatically to replace itself in working position, thus avoiding the breaking of the plough or stopping of the team. 2d, The use of the team guide for managing the team, so as to obviate the necessity of employing many drivers. 3d, The use of the team shade, in combination with the team guide, for sheltering the team from the heat of the sun or from rain.

302. WASHING MACHINES; Henry Yost, St. Louis, Missouri.

Claim—The traversing rubber in connexion with the yielding rack over the surface of the water.

303. SUGAR MILLS; Frederick E. Dake, Assignor to self and Thomas Hunt, Indianapolis, Indiana.

Claim—The combination and arrangement of the lever frame, sliding weight, and rollers, with the bed plate.

304. FISHING NET; Thomas Hall, Assignor to Thomas Hall & Co., Gloucester, Massachusetts.

Claim—The employment of a bag in combination with the seine.

305. NAIL MACHINE; H. Greene and W. J. Gordon, Assignors to Henry Greene, aforesaid, Philadelphia, Pa.

Claim—1st, The combination of the carrying chains and the rack chain with the nail rod holder, to move the rods laterally along the anvil, and turn them simultaneously. 2d, The arrangement of the front edge of the anvil obliquely to the direction of the movement of the carrying chains, for the purpose of causing the nails to be drawn from head to point in the foregoing process.

306. ADJUSTABLE SEATS FOR VEHICLES; George J. Lucas, Assignor to self and John Lucas, Poughkeepsie, N. Y.

Claim—The connexion of the two seats, by means of levers and links.

307. BENDING MOULD-BOARDS FOR PLOUGHS; Benjamin Pitcher, Assignor to self, Wm. Tobey, and John Anderson, Peoria, Illinois.

Claim—The combination of the stationary die with the movable die hinged to the stationary, so that the heated metallic plate subjected to their action is, during the process of being bent into shape, gradually compressed and drawn from its inner to its outer edge, and retained under compression until the entire bending is completed.

308. CONTINUOUS PRIMING FOR FIRE ARMS; Daniel G. Rollin, City of New York, Assignor to George G. Martin, Brooklyn, New York.

Claim—The continuous priming, to be combined with, and operating in, fire arms, by means of an independent cut-off.

309. GAS METRES; Thomas Shaw, Assignor to self and C. S. Paterson, Philadelphia, Pennsylvania.

Claim—The construction of the oscillating drum, in such a manner as to contain the sealing fluid or seal, with lever, attached to said drum, the whole for operating the valve by the oscillation of the drum, in combination with the inlet and outlet passages.

310. SHIPS' CAPSTANS; James R. Taylor, Assignor to Wm. Kiddy, City of New York.

Claim—As of my invention, the freely revolving plate for carrying the intermediate gear wheels, in combination with the capstan head and with the shifting stop.

311. SYPHONIC RADIATOR; Charles Williams, Assignor to self and Charles J. Shepard, Brooklyn, New York.

Claim—The syphonic circulating and radiating pipes, formed with two or more vertical, or nearly vertical, limbs, attached at their upper ends to the shell or casing of the furnace, and connecting their lower ends to each other.

312. OVENS FOR COOKING STOVES; James Easterly, Albany, New York.

Claim—The construction of stove ovens, or analogous structures, by surrounding them with double outside walls, containing in the chamber formed within them some slowly conducting and radiating solid material, to absorb heat communicated on the outside of the chambers, and radiate the same internally.

RE-ISSUES.

1. SAWING MILL; Wm. M. Ferry, Ferrysburgh, Michigan; patented July 21, 1857; re-issued April 6, 1858.

Claim—1st, The particular means and their arrangement. 2d, Effecting, by means of an eccentric, the combination of the log carriage and automatic reversing mechanism, thereby rendering the saw mill capable of self-feeding and self-gigging. 3d, So adjusting the gauging, that its hinge or pivoted joint, and its opposite end or terminus shall always be at the same and equal distances from the set shaft. 4th, The application of the adjustable self-fastening trip to a saw mill, which operates with a continuous rapid motion backward and forward, in combination with the vibrating reversing stop.

2. ROLLERS FOR WINDOW SHADES; Jacob B. Bailey, City of New York; patented February 16, 1858; re-issued April 13, 1858.

Claim—The combination of india rubber, or equivalent substance, with a window shade roller or its pulley.

3. STEAM BOILERS; Wm. M. and J. B. Ellis, Washington City, D. C.; patented September 29, 1857; re-issued April 13, 1858.

Claim—1st, Connecting the water legs, extending from the front to the rear end of the boiler, continuously to the shell of the boiler at the point of the greatest horizontal diameter of the boiler. 2d, Interposing perforated plates between the flanches of the water legs and the shell of the boiler.

4. GRASS HARVESTERS; Jonathan Haines, Pekin, Illinois; patented September 4, 1855; re-issued April 13, 1858.

Claim—In combination with a main frame, a loose cutter bar or finger beam that projects laterally from it, and so hung to the frame of the machine as that in being dragged over the ground, it shall receive all its vertical movements solely from the undulations of the ground over which it is drawn. Also, the bars or rods for connecting the beam to the main frame. Also, the combination of two hinged or jointed rods or bars, for allowing the cutter or finger bar or beam, its vertical, but restraining its lateral motion.

5. PRINTING MACHINE CALLED THE POWER PRINTING PRESS; Isaac Adams, Boston, Massachusetts; patented March 2, 1854; re-issued April 13, 1858.

Claim—1st, Giving the bed its proper periods of motion and rest, and producing impressions, by means of the combination consisting of the crank, the pitman, the declension lever, and the toggle joints 2d, The mechanism for giving the proper periods of motion and rest to the frisket carriage, and each and all the parts attached to it, by means of the combination consisting of the arms, the rocking bar, the inclined plane by which said bar is disengaged, the shaft, and the crank. 3d, The combination of one or more feed frames with the frisket or friskets, or mechanism for receiving the sheets to be printed. 4th, Securing against the platen the sheet to be printed, whereby it is not only kept steady and prevented from bagging, but is also, after the production of an impression upon it, separated from the types in a proper and safe manner. 5th, Constructing the pitman, the bearing surface, the shoulder, and the joint, consisting of its essential characteristics, so as to allow said pitman to be operated. 6th, Producing the impressions, the treadle, or its equivalent, to prevent impressions being taken or produced while other parts of the press are in motion, whenever such prevention may be desirable. 7th, The combination of the double frisket carriage, the bed platen, and the rollers for inking the type, with two sets of inking mechanism. 8th, The combination of the platen, the bed, and distribution cylinders. 9th, The combination of a crank with the carriage, for the purpose of carrying the inking rollers over the form, and for giving the friskets their proper motions and periods of rest. 10th, The mode of constructing the winter or bottom bar, or any equivalent device, by which inconvenient height in the machine is avoided—said winter being made with a ledge or shoulder near its lower part, upon which the toggle joints are sustained. 11th, The combination of the fountain with one or more distribution cylinders and a traveler, the same being for the supply and distribution of the ink. 12th, Placing the apparatus for the supply and distribution of the ink, so that the distribution cylinders rest over, or nearly over, the fountain—the roller which takes the ink from the fountain roller being placed between the fountain and the cylinders. 13th, The mode of laying the ink upon the types by passing the rollers between the bed and platen, said rollers being brought to a stand in their horizontal movement, for the purpose of receiving their supply of ink from a cylinder or cylinders. 14th, The mode by which the nuts, which sustain the impression, are brought to their proper positions and secured there—that is, by the hoops, set-screws, and pins. 15th, The mode of producing the impressions, by means of toggle joints applied to the under or reverse side of the bed. 16th, The combination of the rocker shaft and the levers with the bed, the same being for the purpose of keeping the bed level.

DESIGNS.

1. COOKS' STOVES; G. W. Pittock, G. G. Richmond, and C. Phelps, Troy, New York; dated April 6, 1858.
2. SCREENS FOR STEAM PIPES, &c.; James L. Jackson, City of New York; dated April 13, 1858.
3. SCREENS FOR STEAM PIPES, &c.; James L. Jackson, City of New York; dated April 13, 1858.

The claims on the above, are for the several shapes, forms, ornaments, and configurations.

MAY 4.

1. LAMPS; L. Bailey, Charlestown, and R. Thayer, Boston, Massachusetts.

Claim—1st, The arrangement of the annular reservoir within the case, so that both the inside and the outside drafts of the flame may be supplied up through the base and pedestal, and in their passage cool all sides of the reservoir. 2d, The button, when made of concavo-convex form, and of the proper dimensions, so as to throw the air that passes up through the central passage down on the flame, and at the same time permit the flame to rise vertically instead of spreading it laterally as usual. 3d, The combination of the revolving cap, wick tube, with or without the button, and the annular reservoir, arranged relatively with each other, and used in connexion with the case, the hollow pedestal, and base.

2. SHELTERING FROM DUST THE LOWER CARRYING PULLEY OF BAND SAWS; James Balla, Richmond, Indiana.

Claim—The shields or guards placed over the lower pulley, when constructed and arranged relatively with the straps of said pulley.

3. STEAM ENGINES; Daniel Barnum, Jersey City, New Jersey.

Claim—Combining with an air pump of a marine engine an independent or separate suction pipe, connecting the hold of the vessel with the air pump directly, and not through the channel way or condenser.

4. MACHINE FOR BENDING WOOD; Thomas Blanchard, Boston, Massachusetts.

Claim—The particular means employed for thus bending the wood in the required form—that is to say, the employment or use of the rotating mould with the strap attached, in combination with the sliding pressure bar, provided with the adjustable slide or stop, the outer end of the strap being attached to the bar or box, whereby the strip may be bent in regular or irregular curved form, with the ends adjoining each other for the manufacture of picture and slate frames, chair bottom hoops, and similar articles.

5. MACHINES FOR HULLING RICE; Francis and Lodowick Burdick, South East, New York.

Claim—The peculiar dress in our horizontal stone mill, composed of the frustrum of a cone and its corresponding concave.

6. RAILROAD CAR COUPLING; W. H. Burridge and N. A. L. Post, Cleveland, Ohio.

Claim—Making the fulcra of the jaws forward of, or more towards, the centre of the coupling bar or link, than those parts of the jaws which catch the head of the link, so that the draft upon the link has a tendency to close the jaws, and, in combination with vibrating jaws having their fulcra, the peculiar construction of the link bar, by which the said link connects the couplings when the cars are run together, and by which they uncouple or disconnect themselves when one of the cars is thrown from the track, or the link vibrated upon a given angle.

7. MACHINE FOR MAKING HORSE SHOE NAILS; Tisdale Carpenter, Providence, Rhode Island.

Claim—1st, The machine for making horse shoe nails, consisting essentially of the revolving die table, arm, carrying the swage and shear, the carriage with its swage. 2d, The receiving box with its retaining spring. 3d, In combination with the table, the guide.

8. WATER CLOSET; Wm. S. Carr, City of New York.

Claim—The concave ring or cup screwed on to the hollow column, when this is used for passing the rod to the lever of pan water closets.

9. SEED PLANTERS; James Charlton, Alleghany, Pennsylvania.

Claim—1st, The rings with their lugs, projecting studs, and heads, in connexion with the strips and cylinder, for the purpose of enlarging or contracting the seed chambers, and agitating the seed in the hopper. 2d, The arrangement of the flexible rods, axle, yoke, lever, and strip, with notches.

10. Revolving Fire Arm; Samuel Colt, Hartford, Connecticut.

Claim—In combination with a central pin, which is inserted from behind to admit of readily taking out and replacing the rotating breech, and which is feathered or otherwise fitted to the central bore of the rotating breech so as to turn therewith, and which passes entirely through the central bore of the said rotating breech, and into the framing in front for support, the making of the rear end or head of the said central pin with ratchet teeth, or the equivalent thereof, to be acted upon by the mechanism for turning and holding the rotating breech.

11. Nut Machine; Richard H. Cole, St. Louis, Missouri.

Claim—The use of a traversing die, whereby the nut blank is first pressed and prepared on the blank surface of the said die, and afterwards punched and finished over a hole in the said die.

12. Brick-Kilns; John W. Crary, New Orleans, Louisiana.

Claim—1st, The peculiar arrangement of constructing the furnaces, so that by means of the arches, and constructed of brick, or other argillaceous substance, intermediate supports of grates, or otherwise, for the fuel are rendered unnecessary. 2d, The arrangement of auxiliary ash-pits or air chambers, with main air chambers or ash-pits and arches, formed by setting the bricks zigzag and alternately diagonal. 3d, Constructing the brick arches when the bricks are "set," so that the horizontal area of their interior chamber shall be greater than that of the throat of the furnaces. 4th, The zigzag and alternately diagonal setting of the brick throughout the kiln. 5th, The arrangement and constructing of auxiliary end arches and furnaces, in combination with the main side arches. 6th, The arrangement of vertical flues and horizontal passages in the wall, in combination with the partly open top and the furnaces.

13. Feeding Device for Cross-cut Sawing; Jeremiah Darling, Cincinnati, Ohio.

Claim—The reciprocating table, suspended at one end and supported by rollers at the other, to facilitate the operation of cross-cut sawing.

14. Railroad Car Springs; Andrew M. De Hart, Reading, Pennsylvania.

Claim—The combination of the semi-elliptic plate springs, as arranged with the box, press block and connecting rod.

15. Ring Bolt; George W. Devin, Ottumwa, Iowa.

Claim—The slide bolt, provided with the spring and ring, and secured to the door, in combination with the socket or nosing, provided with apertures to receive the shackle of a padlock.

16. Governing Lateral Motion of Carriage in Gigging Back in Circular Sawing Machines; Wm. M. Ferry, Jr., Ferrysburgh, Michigan.

Claim—Providing a short auxiliary rail alongside the inner rail of the log carriage, and opposite the oblique inclined gauge bar, and furnishing the carriage with an auxiliary wheel which has a vertical axis, and having said wheel come in contact with and run against the side of the auxiliary rail, and thereby prevent any lateral movement of the carriage other than that necessary to prevent the log rubbing against the face of the saw, and heating the same, and also avoid the scratching of the face of the board by the teeth of the saw.

17. Casting Car Wheels; David Finley, Champlain, New York.

Claim—The heating of the knowel and cope of the flask, and parts of the mould contained therein, separately from the chill ring, then putting the whole of the flask and mould together, and either placing it in a box, or its equivalent, and surrounding it with non-conducting material within the said box, and after pouring the metal into the mould, burying the whole in a pit, or omitting the box surrounding the flask and mould with the non-conductor in the pit.

18. Harvesters; R. H. Fisher, Claremont, New Hampshire.

Claim—1st, Mounting the main frame on the axle, so that the frame may slide freely thereon, in connexion with the spirally slotted collar placed on the axle, and receiving a pin attached to the axle, whereby the mechanism which operates the sickle may, when desired, be readily thrown in and out of gear with the driving wheel. 2d, Raising and lowering the sickle by means of the pulley placed loosely on the axle, and the chain attached to the back part of the main frame and to the pulley. 3d, Attaching the finger bar to the main frame, by overlapping the end of the finger bar and the lower end piece of the main frame, the finger bar resting on a semi-spherical projection on the end piece, and adjusted by the screws.

19. Vapor Lamp Burners; C. A. Green, Boston, Massachusetts.

Claim—The combination of the hollow spur, susceptible of being turned in either direction, and having slits or apertures formed in it with the cap, through which similar slits or apertures extend, and for the purpose of regulating the jet or jets of flame by the turning of the said spur.

20. Washing Machine; Ashman Hall, Danville, New York.

Claim—1st, Constructing the slats or bars which form the rubbers with spiral grooved and ridged surface. 2d, In arranging the spiral grooves and ridges formed on the slats, so that they incline in opposite directions in each succeeding slat. 3d, The combination of the dipping scoop with the vibrating rubber.

21. Braces of Eave Troughs; W. H. Henderson, Franklin, Indiana.

Claim—The arrangement of the brace in the trough and with the pins, and also this arrangement in combination with the strap for the better security of the trough.

22. Billiard Table Cushions; George W. Holman, City of New York.

Claim—The whalebone facing to the elastic cushions of billiard tables.

23. Quartz Crushers; Wm. H. Howland, Sacramento, California.

Claim—1st, The arrangement and combination of the annular mortar and pestles. 2d, Having an annular feeding chamber between the upright and the inner surface of the cylinder.

24. Seed Planters; James J. Johnson, Alleghany City, Pennsylvania.

Claim—1st, The arrangement of the flexible bottoms, springs, rod, and division piece, in the seed chambers. 2d, The arrangement of the depositing tube, with tugs, share, rod, lever, and sliding gate.

25. Lamps; Edward F. Jones, Boston, Massachusetts.

Claim—Securing the chimney to the removable cap, and both of them to the lamp, by means of a spring.

26. Revolving Fire Arm; B. F. Joslyn, Worcester, Massachusetts.

Claim—Revolving the cylinder by means of a slotted spring clutch cylinder, operated by a lever.

27. Smut Mills; John C. Kelly and A. Frost, Edinburgh, Indiana.

Claim—1st, The arrangement of the hopper as constructed with the air passage. 2d, The peculiar arrangement of the scourer as constructed with the air passage, connecting spout, and fan, for the purpose of separating the smut from the wheat.

28. Seeding Machines; James F. Kierstead, Laporte, Indiana.

Claim—The reciprocating bar provided with the pendents, and the adjustable perforated bar, in combination with the bar, the parts being arranged relatively with each other and the discharge openings.

29. Corn Husker; Charles N. Lewis, Seneca Falls, New York.

Claim—The combination and arrangement of the lever, tilting arm, blade, and yielding gauge.

30. Mowing Machines; H. Marcellus, Amsterdam, New York.

Claim—Attaching the main frame of the machine to the axle by connecting the frame, by means of journals, to the sleeve L, or collar, which is placed loosely on the axle.

31. Punching Metallic Tubes; B. Mackerley, New Petersburgh, Ohio.

Claim—The combination of the mandrel, the punch, and the detent. Also, the gouge-shaped wedge, in combination with the mandrel and the punch.

32. Automatic Lathe; John McNary, Brooklyn, New York.

Claim—The sliding or traveling lathe heads, between which the stick to be turned is centred, in combination with the rotary cutters, so that the stick will be gradually fed to the cutters until the desired form is given it, and then its feed motion stopped and the stick rotated, so that a perfect symmetrical form may be given it. Further, giving the feed and return motion to the stick to be turned, and also rotating the same from the cutter shaft, by means of the screw on said shaft, worm wheel on shaft F, in connexion with the gearing, screw, worm wheel, and the screw on shaft, G, together with the gearing, through the medium of which the screw shaft I, is rotated, the above parts being used in connexion with the lever and the catch, rod, and with the pawls, actuated by lever and pinion.

33. Steam Boilers; James Montgomery, Brooklyn, New York.

Claim—The arrangement of the series of tubes placed vertically, or nearly so, between an upper and a lower, and connecting vertical water spaces, when said lower water space is made directly over the fire chamber, and the draft is returned over said lower space and among the vertical tubes. Also, the arrangement of the shield plate, in combination with, and interposed between, the crown sheet of the furnace, and the lower ends of the series of water tubes.

34. Check for Screw Cutting; R. Nuttall and John Kirkpatrick, Alleghany, Pennsylvania.

Claim—1st, The projection on the movable die seats, and the transverse slot or notch in the removable cutting dies, the one being adapted to the other. 2d, The use of the troil plate, and operating in connexion with the die seat and die.

35. Fluid Metres; Wm C. Perrine, City of New York.

Claim—Making the measuring chambers gradually larger in each direction, from near the middle where the exterior edges of the diaphragms are fastened, so that the diaphragms will be held by the water or remain in contact with the part so enlarged, until it is drawn away by the centre of the diaphragms or by the plates which move and traverse with the centre of the diaphragm. Also, the recesses in the ends of the measuring chambers, in combination with the plates arranged to work in them (the said recesses). Also, the openings in the plates, provided with the valves, or such equivalent openings as will answer the same purpose. Also, making recesses with their sides parallel in the flanches, so that that portion of the diaphragm in or opposite to said recesses may vibrate a very little between the measuring chamber and the line where it is bound or held firmly by the flanches.

36. Hoisting Machines; Reuben Packard, Rockland, Maine.

Claim—The circular plate, or its equivalent, in order that it may be turned easily and held in any desired position by pawls, or their equivalents, for the purpose of sustaining any combination of mechanical powers constructed thereon, for drawing or lifting heavy weights, or their equivalents.

37. Cast Iron Pipe; C. Pomroy, Pottsville, Pennsylvania.

Claim—A cast iron pipe chilled inside, as a new article of manufacture, for the purpose of conveying fluids impregnated with or containing substances which soon destroy iron pipes "which are not so chilled."

38. Arrangement of Gas Engines; John C. Fr. Salomon, Baltimore, Maryland.

Claim—1st, Arranging all the parts necessarily employed in generating and working gaseous vapor within a tight chamber, which is supplied with oil, hot air, or other suitable heating medium. 2d, The employment in combination with the above named tight chamber, of the combined arrangement of fire flues, smoke stack, circulating coil, boilers, vapor chest, and cylinder.

39. Cements for Roofing; R. Simons, Rockford, Illinois.

Claim—The composition of ingredients when compounded.

40. Device by which the width of the Bolt checks the Feed in Shingle Machines; A. C. Sawyer, Clinton, New York.

Claim—The use of a lever hanging by the side of the saw, in such manner that the bolt in running under it will raise or lower it and adjust the travel of the carriage.

41. Sewing Machines; E. Harry Smith, City of New York.

Claim—Arranging the cranks and connexions to the needle and shuttle, whereby the differential movements are imparted to the needle and shuttle.

42. Method of Ventilating and Excluding Dust from Railroad Cars; A. B. Spencer, Rochester, N. York.

Claim—The revolving wet sheet or endless apron (passing through water), for the purpose of cleansing and purifying the air as it passes into the car—which sheet or apron, together with the tank containing the water, and that portion of the bottom whereon it rests, I claim as a partition by which I divide the instrument into two complete ventilators, either of which will act as the downward ventilator, while the other always acts simultaneously in the opposite direction.

43. Gas Generators; Wm. N. Taylor, Philadelphia, Pennsylvania.

Claim—1st, The [combination of the retort with a series of movable partitions connected so that all can be taken out together, and so arranged as to divide the retort into a series of chambers through which the gas

circulates in its passage from the lower chamber to the discharge pipe. 2d, Dividing these chambers by means of punctured diaphragms, or their equivalent, in order to retard the passage of the gas, and bring the entire volume in contact with the heated metal.

44. LAMP ATTACHMENT FOR PREVENTING SMOKE, &c.; Ralph Thomas, Hoboken, New Jersey.

Claim—The movable cap provided with a shreved screen top and base piece, when applied to lamps.

45. TYMPANS FOR PRINTING PRESSES; L. T. Wells, Cincinnati, Ohio.

Claim—Attaching the cloth or parchment to the frame of the tympan, by means of the leather strips provided with eyelets, said strips being fitted in grooves or rebates in the frame, and the cloth or parchment attached to the strip of the lace.

46. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—So hinging the bar or beam which carries the cutters and fingers to the beam, as that it may be raised up, folded over, and carried upon the main frame. Also, in combination with the beam, the braces, rigidly connected therewith, but hinged at their opposite ends, so that the beam may rise and fall at pleasure, but be permanently braced in its proper position to give the cutter and finger bars or beams in turn their proper working position.

47. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—In connexion with the inner shoe, an adjustable supporting wheel, when said wheel is in advance of the point of the driver or shoe.

48. HARVESTERS; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—So combining a reel with a platform and main frame that are hinged together, as that the raising and lowering of either shall not in any wise injuriously affect the rotation and uniform action of the reel or change its position with regard to the cutters.

49. SHEET METAL CHAINS; James Lancelott, Cranston, Assignor to Sacket, Davis & Co., Providence, R. I.

Claim—The forming of the body of each link into a dome, dish, or cup, so as to admit of the projecting arms of each link being bent at a very acute angle against the sides of the dome or cup of the next succeeding link.

50. SAWING MACHINE; H. S. Vrooman, City of New York, Assignor to Henry Albro', Covington, Kentucky.

Claim—1st, The traveling or sliding collar on lever, as connected with the knife or saw frame, the pawl arms, in combination with the reciprocating connecting rod, the vibrating lever, the pawls, and the ratchet wheels, whereby an increasing rotary speed of the log or bolt is obtained from the traveling collar passing down to a wider sweep of lever, the power being transmitted from the ratchet shaft to the bolt 2d, The cutters attached to the carriage, operated automatically by, and in combination with, the vertical screws. 3d, The lateral moving knife plate or stock, crank, operated by, and in combination with, the vibrating lever. 4th, The combination of the knife, cutters, and the feed movement of the bolt or log.

51. BOOT TREES; Wm. W. Wilmott, Assignor to self and Henry F Gardner, Boston, Massachusetts.

Claim—The arrangement of the two sets of toggles and the application thereto of the screw rod, in such manner that it may be free to move longitudinally during its rotary motion on its axis. Also, combining the regulator or latching mechanism (or their equivalent), with the back and front parts of the leg portion of the boot tree, and the separating mechanism applied thereto.

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52. SELF-REGULATING GRAIN MEASURE; George W. Atkins, Milton, Delaware.

Claim—1st, The arrangement of the platform, in combination with a box or case, so that the said platform shall have an up and down motion by turning as a lever upon the hinge, or its equivalent, and being supported by means of the double-cross lever and spring, in such a manner as to yield downwardly under the weight of the measure of grain when it is placed thereon, and spring upwardly on moving the same. 2d, In combination with the said ratchet wheels, pawls, lever, indexes, and platform, the two bells, or their equivalents, for the purpose of indicating audibly both the single and hundreds of measures of grain registered by the index.

53. WATER WHEEL; Jesse Bartoo, East Aurora, New York.

Claim—The iron segment, in combination with the adjustable band and semi-cylindrical cap.

54. CHURN; WM. Brown, Duncannon, Pennsylvania.

Claim—The combination in a churn dasher of a series of slatted agitating and separating wings, a series of gathering and retaining flanches, and a solid concaved roll forming hub.

55. DRESSING AND SIZING WARPS; Wm. Bradley, Manchester, Virginia.

Claim—The combination of the section sleys or reeds, together with the warp sleys or reeds, and the harness for taking the lease or cross shed before the warp is sized in every alternate thread or threads, so as to allow the lease rods to pass with the warp to the yarn beam, and thus dispense with the use of combs, rowels, or guides, after the warp has passed through the size.

56. HARVESTERS; C. B. Brown, Alton, Illinois.

Claim—Placing the endless apron in an oblique position with the sickle. Also, the endless apron, in combination with the guide rods and sickle, when the several parts are placed relatively with each other.

57. METHOD OF SEATING THE MOVABLE CUTTER IN EXPANSIVE BITS; Wm. A. Clark, Bethany, Connecticut.

Claim—The combination of the V shaped projection or seat, or its equivalent, with the corresponding groove in the movable cutter above the cutting edge, by which I am enabled to vary the distance of the edge of the cutter near the stock above that of the central cutter to any desirable extent.

58. CORN PLANTERS; Robert J. Clay, St. Louis, Missouri.

Claim—The arrangement of the hopper valve, wheels, shaft, standard, and scraper, when the whole are constructed and operated conjointly.

59. FASTENERS FOR SLEEVE BUTTONS; Henry Cogswell, Providence, Rhode Island.

Claim—Constructing sleeve buttons by attaching the bar to the projections at the inner side of the plate, one end of the bar being pivoted in one projection, and the other projection containing a catch and spring to retain the opposite end of the bar when closed.

60. HARROWS; Jonas C. Conkey, Washington, Ohio.

Claim—The combination of the hinge, axle, and axle-tree, when arranged in connexion with revolving harrows.

61. GRAIN CLEANING MACHINES; John DeRush, St. Mary's, Ohio.

Claim—The scouring plates, fan, and suction spouts, when combined and arranged relatively with each other.

62. HUB MACHINE; Lovett Eames, Kalamazoo, Michigan.

Claim—Operating or giving the seed movement to the carriage in which the mortising tool is fitted or placed, by means of the horizontal rotating disk, provided with the ledges, and having its shaft stepped in the treadle, in connexion with the rollers on the shaft, which is rotated from the driving shaft.

63. RECLINING CHAIR; Augustus Eliaers, Boston, Massachusetts.

Claim—1st, The general arrangement of the chair, whereby the back foot-rest, &c., are sustained and actuated, and the foot-rest made adjustable and locked in any desired position. Also, the combination of the hinged rails, sliding arms, and mortises to receive the rails, or in lieu of the rails entering the mortises, in the said combination, the arm attached to the back and turning upon a pivot in the grooved or mortising sliding arm, whereby I am enabled to obtain a very long arm.

64. PIPES FOR SMOKING TOBACCO; James W. Evans, City of New York.

Claim—The combination of the bulb or chamber and the sponge, or any other suitable material saturated with water, in the construction of smoking pipes or cigar holders.

65. WATER WHEELS; J. H. Fairchild, Jericho, Vermont.

Claim—The tube, in combination with the wheel formed of the screws placed on a shaft, and working within the tubular projections. Also, in combination with the wheel and draft tube, the gates.

66. TIME-KEEPERS; Henry C. Fay, Troy, New York.

Claim—The invention of a verge with movable detents, so constructed that in the vibrations of the pendulum or balance, each detent will be carried on, nearly on, or past its dead centre so as to greatly lessen the recoil of the movement.

67. BEE-HIVES; Edward P. French, Nashua, New Hampshire.

Claim—Making the lower part or both sides of the main chamber inclined toward the orifice of entrance, in combination with the arrangement of an exercising and entrauce chamber, feeding-box, warm air spaces, and air ventilating passage leading from the exercising chamber upward against the front sides of the secondary chambers, and over their tops into the chamber, the main chamber communicating with said passage only by means of orifices at its bottom, whereby the main and secondary chambers are kept warm, and at the same time relieved of bad air or carbonic acid gas by a ventilating current of air induced by their heat.

68. PRESERVE CANS; Edwin W. Gilmore, North Easton, Massachusetts.

Claim—The arrangement of the arm, and the cam, and the bar, whereby the cam is not only made to operate to aid in strengthening the bar when supported, but the arm is enabled to operate as a stop to maintain the can in place while forcing down the cover.

69. PRINTING PRESSES; George P. Gordon and F. O Degener, City of New York.

Claim—Communicating motion to the cylinder at the time of giving the impression by and through the motion of the bed, while the revolution of the cylinder shall be perfected by or through ordinary gearing, or other means entirely independent of the motion of the bed, thus alternating from one of these means to the other, to give a full revolution to the cylinder.

70. PAINT COMPOUNDS; Wm. G. Huyett, Williamsburgh, Pennsylvania.

Claim—A paint compound composed of ground calcined iron ore, lime, and carbon.

71. SOFA BEDSTEAD; John Irwin, Philadelphia, Pennsylvania.

Claim—The hinge, in combination with the back and seat of sofa bedsteads.

72. CULTIVATORS; L. W. Kelley, Brunswick, Ohio.

Claim—The combination and arrangement of teeth beams with their attaching and adjusting bars, and the scrapers with their attaching and adjusting bars, with each other and with the central beam.

73. CORN MILLS; Charles Leavitt, Cleveland, Ohio.

Claim—The manner of securing the revolving grinder to the spindle, by means of the collar, wings, cap, and nut; also, the recess in the outer casing, in combination therewith the adjusting and securing the grinder in place, by means of the outer casing and the diaphragm upon which the grinder is superimposed. Also, dividing the surfaces of the two grinders into an unequal number of parts or sections, for the purpose of bringing the several sections of the grinders successively into operation; and also, the diaphragm, when arranged in relation to the support of the spindle and grinder, and the collecting and discharging of the meal at one point.

74. CANS FOR PRESERVING FOOD; A. S. Lyman, City of New York.

Claim—The combination of the reservoir or filter of suitable material, with a can having an arrangement for discharging its contents in such manner that whenever any food is drawn off, air or gas deprived of the primary cause of decomposition shall supply its place.

75. WRENCH; James McKenzie, Green Island, New York.

Claim—Fixing the movable jaw of an adjustable wrench by a toothed wedge passing through the said jaw fitting into the teeth or notches on the shank, so as to keep the movable jaw firm to resist all pressure that may be applied to it.

76. REAPING AND MOWING MACHINES; L. J., Wm. S., and C. H. McCormick, Chicago, Illinois.

Claim—Making the finger bar of a mowing machine of a bar of iron, wedge-formed in its cross section, with its forward edge which carries the fingers made thin, that the sickles may act upon and cut leaning grass, and with its rear edge thick to obtain the required strength, and the under surface inclined that it may act like a runner to pass and ride over the surface of the ground, to keep the cutting edge of the sickle clear of obstructions, whilst at the same time it can have access to leaning grass.

77. COMPOUND PHOTOGRAPHS; T. Miltenberger, Bellefontaine, Ohio.

Claim—The production of a compound photograph, or the taking of separate distinct photographic im-

pressions on each side of a glass plate or transparent tablet, and producing thereby a compound relievo or double stereoscopic effect on a single or simple plane or flat surface, in combination with a totally black back ground, through which solely is produced a transparent collodion film.

78. CARTRIDGE CASE; George W. Morse, Baton Rouge, Louisiana.

Claim—My improved cartridge case as constructed with a tige, an annular shoulder, and an expansible cartridge closer, arranged within the body of the cartridge, and made to slide longitudinally therein.

79. BINDING DEVICE FOR HARVESTERS; George Notman, Deerfield, Ohio.

Claim—The grain box or receptacle, revolving fork, sliding fork, rod, slide, bar, and sliding bottom, used in connexion with any proper raking or conveying device, whereby the grain as it is cut is bound and discharged in sheaves from the machine.

80. COTTON GINS; Enoch Osgood, Boston, Massachusetts.

Claim—The combination of the oscillating clearer and the concave guard or plate, constructed and arranged with the cylinder and the rack and made to operate therewith.

81. SELF-INKING HAND STAMPS; S. E. Pettee, Mansfield, and E. G. Cobb, Foxborough, Massachusetts.

Claim—The roller, or its equivalent, on the lever, working against the curve, or its equivalent, on the lever, to operate said lever and carry the inking roller on, across, and off of the type parallel, or nearly parallel, with the face of the type, so as to ink them uniformly and evenly to make a fair impression.

82. IMPLEMENT FOR SHOOTING MISSILES, &c., ON RAILROADS; S. Scattan, Richmond, Indiana.

Claim—1st, The combination of a tube and gravel feeder with a locomotive. 2d, The arrangement for closing and opening the slide when combined with lever and tube. 3d, The self-adjusting valve in combination with tube. 4th, The elastic disk combined with tube and plug.

83. INSTRUMENT FOR SHARPENING SLATE PENCILS; Gerad Sickels, Brooklyn, New York.

Claim—The instrument consisting of a piece of steel, with an arched concave surface on which teeth are cut, and with eyes at its ends to attach it to the slate frame "or other foundation."

84. CIDER MILLS; Michael Stevens, Lucas, Ohio.

Claim—The arrangement of the several parts, for the purpose "of retaining the liquor."

85. HARVESTERS; Oren Stoddard, Busti, New York.

Claim—The supplementary sickle, connected with the sickle proper, and placed relatively with the sickle.

86. HARNESS TUG BUCKLE; W. Straw and R. H. Armstrong, Hudson, Michigan.

Claim—The plate provided with one or more tongues attached to the frame at one end, by means of a sliding joint, and attached at the opposite end to the frame, by means of a catch and dovetail connexion formed by the groove in the cross-piece of the frame, and the beveled front end of plate.

87. CORN HUSKERS; Daniel C. Smith, Tecumseh, Michigan.

Claim—The combination of the forceps with the wedge, roller, lever, post with its slot, the knife and plate. Also, in combination with the forceps, the spring, fork, and thumb-screw.

88. STRAW CUTTERS; Solomon P. Smith, Crescent, New York.

Claim—The arrangement of the arm knife and recoil spring with straw box.

89. HARVESTERS; Henry C. Smith, Cleveland, Ohio.

Claim—The application of the intermediate wheel at the end of the finger bar, when used in combination with the curved lever and flexible rod. Also, the stops, connected to the frame and placed in such position to the line of draft as will tend to counteract the dragging of the guards or finger bar upon the ground, when hinged to the axle of the driving wheel by the arms. Also, the steps, in combination with the spurs attached to the arms, for the purpose of raising the cutter bar in connexion with the described system of leverage. Also, the rabbet or groove formed in the heel of the cutter bar.

90. BRUSH; J. H. Tatum, City of New York.

Claim—The brush constructed so as to form a new and useful article of manufacture, viz: having the bristles secured in detached positions in a metal plate, which forms the back of the brush.

91. HARVESTERS; John S. Troxel, Mt. Pleasant, Pennsylvania.

Claim—Hanging and operating reels for harvesters on the main shaft, by means of yoke lever and slotted lever, rod, and movable arms, slotted blades, pulley, strap, and slotted plate with screw bolt.

92. LASTS; Sidney S. Turner, Westbro', Massachusetts.

Claim—A last made of wood, and provided with metallic edge guards, and with grooves arranged along and against the inner sides of such guards, and for the purpose of receiving strips of wood, or other suitable material, for the points of the pegs to enter while the last is in use, or a shoe thereon is being pegged.

93. REPEATING ORDNANCE; Grey Utley, Louisburgh, North Carolina.

Claim—The shaft with cams, in combination with the reciprocating hammer, the laterally moving toothed wheel, and the detent, said parts being connected and operating with a many-chambered breech piece having a rectilinear movement.

94. WASHING MACHINE; Miner Van Auken, Chazy, New York.

Claim—The adjustable stop board, arranged at the rear end of the rubber, in combination with the scroll terminating slots in the pendulous arms of the rubber.

95. IRONING TABLE; Wm. Vandenburg, City of New York.

Claim—The ironing table composed of a board attached to one end of a stand in such manner as to be capable of moving horizontally thereon to and from the other end of the stand, that it may be supported at both its ends during the ironing operation, but permitted to have a garment passed over one end before and after the ironing operation.

96. BURNERS FOR VAPOR LAMPS; Thomas Varney, San Francisco, California.

Claim—The arrangement of the tubes and the passage between them, the burner tip, the wick, and the pipes.

97. WORKING SHIPS' LOWER SAILS IN COURSES; Samuel Very, Jr., Salem, Massachusetts.

Claim—Constructing what are commonly known as the "courses" of a vessel, viz: the foresail, mainsail, and cross-jack, with a central clew for a sheet or tack in addition to the usual sheet and tack of such sail, for the purpose of enabling a lighter crew to handle those sails.

98. Water Wheels; A. Warren and E. Damon, Wareham, Massachusetts.

Claim—The supplementary or auxiliary buckets attached to the underside of the lower rim of the wheel, and arranged relatively with the edge of the rim and plate. Further, in combination with the auxiliary buckets, the annular shaped plate, and attached to the scroll in connexion with the ledge on the upper surface of the disk of the wheel.

99. Fly Nets; Robert Wilson, Milton, Pennsylvania.

Claim—The peculiar construction of the fly net, having the stitch set parallel with the rib, combined with the two right angles, formed by the lashes passing through the rib, whether ribs are made flat, round, or any other shape.

100. Metallic Rolling Shutters; Wm. E. Worthen, City of New York.

Claim—1st, A revolving shutter, composed of slats of double thickness of sheet metal, so formed at their edges that each slat shall interlock with its neighbor, by being bent at the edge into a configuration. 2d, The combination of a series of such slats having such interlocking edges, with a chain on the side thereof, said chain being constructed and combined with the slats.

101. Railroad Car Brakes; George W. Zeigler, Tiffin, Ohio.

Claim—The application of pressure to the rubbers by a longitudinal rotary rod under the truck, combined with cams. Also, in combination with the rods and cams of the several cars, the universal joint coupling, to connect the aforesaid rods throughout the train. Further, transmitting the power to rotate the rods through a spring indicating apparatus.

102. Sash Fastener; F. W. Brocksieper and J. B. Sargent, Assignors to Jos B. Sargent, New Britain, Conn.

Claim—The bolt as an attachment to a sash fastener.

103. Steering Apparatus; S. B. Cram and C. Weed, Assignors to S. B. Cram, Boston, Massachusetts.

Claim—1st, The screw and nut, in combination with the ropes. 2d, In combination with the above, the thin tightening apparatus, or any equivalent thereof. 3d, In combination with the ropes or chains as applied to "mechanical steerers," we claim the employment of springs.

104. Candy Machines; George K. Tarrington and S. B. Brown, Jr., Assignors to selves and David B. Tiffany, Xenia, Ohio.

Claim—The construction of the machine, the construction of the sugar kettle and spouts, the method of cutting off all the drops with one stroke of the knife, working vertically in connexion with the adjustable pitman.

105. Forks for Elevating Hay; C. E. and J. A Gladding, Assignors to C. E. Gladding, Troy, Pennsylvania.

Claim—The head, joint, strap, plate, loop, and cord or wire, whereby all projecting arms are dispensed with, so that the instrument when not required for hoisting purposes may be used as a common fork.

106. Utilizing Waste Vulcanized Rubber; H. L. Hall, Beverly, Massachusetts, Assignor to "The Beverly Rubber Company."

Claim—Restoring of waste vulcanized rubber by grinding it and mixing it with asphalt, coal tar, rosin, pitch, shellac, or other similar substances, so that it can be used again in the manufacture of vulcanized rubber fabrics, and be as serviceable, or nearly so, as where the fabrics are made with the use of the native rubber.

107. Finger or Guard for Harvesters; Lewis Miller, Assignor to C. Aultman & Co., Canton, Ohio.

Claim—1st, Forming the shoulder on a wrought iron guard, by welding on a piece instead of drawing down a large bar. 2d, The shaping, beveling, and trueing of the guard or finger so as to make them of uniform shape and size by means of a block.

108. Washing Machine; D. E. Rohr, Assignor to self and T. W. Davis, Charlestown, Massachusetts.

Claim—The construction of the fluted rotary device, the sliding reciprocating scoop, with fluted or grooved squeezer or washing board, with yoke beam and pendant devices.

109. Guides for Sewing Machines; L. W. Serrell, Brooklyn, Assignor to John Harold, Hempstead, N. Y.

Claim—1st, The detached tongue around which the edge of the cloth to be hemmed is folded or wrapped to a greater or less extent. 2d, The adjustable hem spreader, in combination with the tongue. 3d, The combination of the separate or detached tongue with the inclined tucker, to pass the edge of the cloth beneath the said tongue, between that and the material on the bed to form the hem. 4th, The finger, in combination with the tongue. 5th, The gauge, in combination with the hem spreader and gauge.

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110. Fastening for Hame Tugs; Joseph E. Ball, Newark, New Jersey.

Claim—The combination of the loop, the dovetailed slide or key, the projections and plate.

111. Opening and Closing Farm Gates; Wm. F. C. Beattie, Cornwall, New York.

Claim—The combination of the handles with the latch.

112. Fastening Railroad Rails; Sidney A. Beers, Kings County, New York.

Claim—The use of a bolt or bolts, with nut, key, or clinch, (in combination with, or as an improvement on, the rail patented to me by Letters Patent dated October 27th, 1857,) the bolt passing directly through both rails horizontally, and also the form of the mortises, separate or combined.

113. Machinery for Hulling and Threshing Clover; John C. Birdsell, Rush, New York.

Claim—The arrangement of the slatted belt with the bolt, table, threshing cylinder, hulling cylinder, and fan—it being understood that I claim the above only as applied to the construction of clover hulling machines.

114. Making Shot; Alfred Booth, City of New York.

Claim—The filling a chamber with spray and dropping molted lead through it, to facilitate the cooling of the shot.

115. Reaping and Mowing Machines; J. W. Brokaw, Assignor to Warder, Brokaw & Child, Springfield, O.

Claim—The construction and combination of the shell standards and sliding boxes, when used in connexion with a change of pinions, and operating in relation thereto.

116. Escapement of Time-keepers; Samuel Carpenter, Flushing, New York.

Claim—1st, So constructing a scape-wheel with two rims or rows of vertical teeth, or their equivalent,

as to admit the potance or lower bearing of the staff which carries the pallets and balance to be placed between said rims or rows of teeth, for the purpose of giving double action to the pallets, by which means the watch is prevented from setting by a sudden jerk, as a tooth of one or other of the rims will be acting on its corresponding pallet. 2d, The pallets, in combination with the wheel and detent spring.

117. CORN HUSKERS; Joseph Cawthra, Rochester, New York.

Claim—The inclined reciprocating husker, in combination with the stationary teeth, the inclined curved grate, and the slide.

118. RAILROAD CARS FOR DAY AND NIGHT SERVICE; J. B. Creighton, Tiffin, Ohio.

Claim—1st, The formation of car beds by means of the stationary seats and reversible backs as now in use, in combination with the slotted supporters, stops, pins, stretchers, eccentrics, and reversible hooks. 2d, The method of forming and concealing when not in use in the spaces between the windows, an upper tier of beds; and also, the same, in combination with the devices constituting the subject of the 1st claim.

119. ELECTRIC LAMP; Henry M. Collier, Binghamton, New York, and Henry N. Baker, City of New York.

Claim—The employment in an electric lamp of an open seat, contained in a stationary bridge plate, or its equivalent, and receiving the electrode in such a manner as to allow the point only thereof to protrude through it the distance required, and permitting the advance of the said point so fast only as it is oxidized and reduced by the electric current. Also, the combination of the loaded tube carrying the upper electrode, the open seat, and the mercury tube, in which floats and is secured the lower electrode, so that while the upper tube feeds the upper electrode down to the open seat as fast as it is reduced, the lower electrode is also fed up as fast as reduced, and kept in its proper position with reference to the upper electrode.

120. BALLOT-BOXES; Allan Cummings, City of New York.

Claim—The peculiar formed cover or top, combining the glass plate, transparent tube, and the wire screens constituting the sides.

121. HORSE POWERS; Jeremiah Darling, Cincinnati, Ohio.

Claim—The independent and endless series of friction rollers, in combination with the double flanched track and the peculiarly constructed endless apron, for the purpose of preventing friction, and for increasing the efficiency of the horse power.

122. MEAT CHOPPER; L. A. Dole, Salem, Ohio.

Claim—The arrangement of the horizontally slotted reciprocating vertical knife shaft, grooved ways, horizontal crank shaft, and central guide tube, for use in combination with the gearing into the same, loose and fast pinions, arranged on the stationary axis of the large driving pinion, and two small pinions which are arranged on a shaft passing through the face of said driving pinion, and have an independent motion of the pinion, while they and it move round a common stationary axis, and are actuated by the same crank or belt.

123. CARD PLATES FOR TRUNKS; Joseph Dudley, Fall River, Massachusetts.

Claim—The frame provided with transverse bars and an elastic plate, the frame being secured to the trunk.

124. CULTIVATORS; John Endsley and Elihu Fletcher, Abington, Indiana.

Claim—The arrangement of shanks and shovels with saddles and beam.

125. BARREL-HEAD MACHINE; Benjamin Fitch, Mooers, New York.

Claim—1st, The combination of the frame and the plane stocks, operated by the movement of the handle. 2d, The combination of the friction band with the swinging platform, operated at one and the same time through the handle. 3d, Releasing the spring catch from the arm, to allow the frame to return to its first position after the saw has effected its purpose, by the lever acting upon the stop.

126. PENCIL SHARPENERS; Walter K. Foster, Bangor, Maine.

Claim—Making the pencil sharpener with a space (or its equivalent), so arranged beyond the inner end of the blade, as to cause the pencil lead to be turned or reduced cylindrically while passing beyond the inner or upper end of the knife. Also, the arrangement of the space with reference to the handle, that is, so as to be separated therefrom or not open into the space or opening thereof. Also, making the body of the pencil sharpener with a light port or opening, arranged opposite to the chip throat. Also, arranging the auxiliary chamber, or its side, with respect to the conical chamber, so that while the lead is being cut by the knife, the lead may not touch the side of the auxiliary chamber, or be so near it as to be ground or injured by particles of lead which may adhere to the sides of the auxiliary chamber.

127. WOVEN TUCKED FABRICS; Thomas France, City of New York.

Claim—The tucked fabric produced entirely by weaving.

128. RAILROAD CAR COUPLINGS; Francis E Gleason, Columbus, Ohio.

Claim—The arrangement and construction of the catch with relation to the bar, and this in combination with the foot-piece, bars or rods, spring, and link.

129. COOKING STOVES; Renselaer D. Granger, Philadelphia, Pennsylvania.

Claim—1st, Combining an oven constructed of burnt fire clay, or other equivalent material, capable of absorbing and retaining heat with an ordinary cooking stove, in such a manner that the products of combustion may pass either around or through the interior of the oven. 2d, The arrangement of the annular perforated tube and its air pipe with the lining.

130. CORN SHELLERS; Ray Green, Cussawago, Pennsylvania.

Claim—The shelling cylinder revolving within the feeding cylinder, in combination with the feed regulating slide, concave, and springs, fingers, discharging apron, and spout.

131. THICK WOVEN FABRICS; John Gujer, Philadelphia, Pennsylvania.

Claim—The manufacture of stout textile fabrics of considerable thickness, in which all the warp threads are interwoven with the filling threads.

132. FORMING THE HEADS OF CARRIAGE SPRINGS; Samuel H. Hartman, Pittsburgh, Pennsylvania.

Claim—Forming the head or socket on the head plate of a spring, by subjecting them to the action of the dies and counter-dies in the die blocks, and the levers, in the order of their sequence.

133. PLOUGHS; John M. Hall, Warrenton, Georgia.

Claim—The construction, arrangement, and combination of the body of the implement and its movable parts, whereby it is readily adapted to properly receive in turn the several parts employed for performing the various modes of cultivation.

134. Machines for Cleaning Cotton; Thomas Oliver, Yazoo City, Mississippi.

Claim—The arrangement of the toothed rollers, the guides, and toothed carrying apron.

135. Harvesters; Martin Hallenbeck, Albany, New York.

Claim—The tail bar, hinged to the bar, and having the supporting wheel at its rear end, in combination with the lever for adjusting the inclination of the cutters.

136. Harvesters; Martin Hallenbeck, Albany, New York.

Claim—The cutters fitted to move above the level of the heel bar, in combination with the separate guide caps and coupling bars.

137. Signs; James Harrison, Albany, New York.

Claim—The construction of block letters, figures, and other devices, with an interstitial surface of carved ornamental work, with which a colored or illuminated back ground may be employed for rendering signs clearly perceptible at a great distance when viewed obliquely.

138. Stoves; Joseph C. Henderson, Albany, New York.

Claim—The chamber contracted at the top so as to produce and maintain while in action a plenum within the combustion chamber, when used in combination with the exterior chamber and connected by partitions, for the purpose of preventing the escape of the volatile combustible from the combustion chamber, before its combustion is consummated.

139. Reaping and Mowing Machines; Charles Howell, Cleveland, Ohio.

Claim—Connecting the outer end of the finger bar with the gear block, by means of a curved bar, whether it forms a prolongation of the gear block or otherwise.

140. Presses for Zincographic Printing; G. H. Korff, Hoboken, New Jersey.

Claim—1st, The cylinder, in combination with the inking rollers and moistening rollers, the rollers having their bearings connected with rods and used in connexion with the adjustable rings, so that either of the rollers may be moved out from the cylinder, or all moved simultaneously as may be desired. 2d, In combination with the cylinder and rollers, the pressure rollers in connexion with the bars and shaft provided with projections, for the purpose of producing the "bite," or subjecting the paper to the proper pressure between the cylinder and roller. 3d, The feed rollers fitted in elastic bearings and arranged relatively with each other, the pressure roller, feed board, and cylinder, whereby with the aid of the curved rods on the cylinder, the blank sheets are fed between the cylinder and roller. 4th, The peculiar construction of the cylinder and rollers, having plaster of Paris moulded around tubes, so as to obtain the necessary strength and inflexibility with a requisite degree of lightness.

141. Machines for Grinding and Sizing Paper Pulp; Joseph Jordan, Jr., East Hartford, and Thomas Eustice, Hartford, Connecticut.

Claim—The manufacture and sizing of pulp, that is, as constructed of a single conical grinder and outer shell, and with pipes for the introduction of the rags, and the size, and the eduction of both, arranged with reference to the axis and ends of the grinder, and so as to enable the grinder to operate to reduce the rags to pulp and mix the sizing therewith.

142. Hame Tug Fastener; E. D. Lockwood, Churchville, New York.

Claim—Connecting the hame tug to the tongue by means of a joint, so that any strain upon the tug will tend to turn and lock the stud or pin, thus rendering the contrivance self-fastening.

143. Horse Powers; B. F. Love and J. H. Frazee, Shellyville, Indiana.

Claim—The friction wheel and fly-wheel, in combination with spring, lever, and levers on the ends of shafts.

144. Safety Drop for Keys; R. K. Lee, Brooklyn, New York.

Claim—The revolving disk on the rear side of the notched drop. Also, the employment of the notched drop, the eccentric, and disk.

145. Block for Repairing T-rails; S. Mason and E. M. Davis, Michigan City, Indiana.

Claim—The method by which we combine the clamps with the bed-piece or main blocks, by means of the studs or trunnions and the concentric bearings.

146. Toothed Cylinder for Grinding; B. Mackerley, New Petersburgh, Ohio.

Claim—Producing a new manufacture in the shape of an improved toothed cylinder, by combining a properly perforated tube with a series of teeth and the journal pieces.

147. Vapor Lamps; H. N. Macomber, Lynn, Massachusetts.

Claim—Making the ascending and descending air passage of the lamp of a series of chambers, each connected with the other, the whole opening out of and into the reservoir of the lamp.

148. Spring Rocking Cradle; J. B. Malbert and A. Cheviron, St. Louis, Missouri.

Claim—The arrangement of this double escapement with the escape wheel, the wheel being operated by the combination of wheels and springs.

149. Machines for Applying Cop Tubes to Spindles; John Marland, Lawrence, Massachusetts.

Claim—The machine for putting cop tubes upon spindles.

150. File Machines; F. M. Mattice, Buffalo, New York.

Claim—The cut-off valve, lever, cam, plunger, chest, and cams, when arranged and operating in conjunction, for the purpose of opening and closing the passage while filling the chest and discharging the contents of the same by the openings.

151. Machine for Worming, Parceling, and Serving the Rigging of Vessels; P. McLaughlin, Camden, Me.

Claim—The arrangement of devices for worming, parceling, and serving rope, in combination with suitable devices for holding and straining the same.

152. Mill for Treating Chinese Sugar Cane; Henry Meyer, Bridgeton, New Jersey.

Claim—1st, The arrangement of the rollers, the strips, and the revolving cutter 2d, The expanding strippers, in combination with the rollers, the same being arranged in relation to each other.

153. Aerovapor Burners for Lamps; Oscar F. Morrill, Boston, Massachusetts.

Claim—The arrangement and application of the bent tube with the wick holder or vaporizer, provided

with one or more heat conductors, or equivalent devices, the same being to enable the production of vapor to be regulated and conducted into the mixer. Also, the mode of applying the rod of the wick tube slider to the generator, viz: by carrying it through a tube extending through the reservoir of the generator.

154. CHASING MILLS; Charles Moore, Trenton, New Jersey.

Claim—Making a chasing mill self-feeding, automatically and continuously, by means of one or more circular troughs, which receive the substances to be ground or acted upon, and deliver them through spouts on to the bed of the mill under the chasing wheel. Also, the scraper, so constructed and operated as to separate that portion of the material on the bed of the mill which is ground most, automatically and continuously, from that which is ground less, and deliver it to the discharge opening in the bed of the mill. And in combination with a continuous, automatic, self-feeding apparatus, or a continuous, automatic, self-delivering apparatus applied to a chasing mill, a heated bed, so as to heat, grind, mull, and mix the materials to supply to the mill automatically or without manual labor, at one and the same time.

155. MANUFACTURE OF METALLIC ZINC; Alfred Monnier, Camden, New Jersey.

Claim—The process of obtaining metallic zinc from its ores, by means of the combined metallurgic operations.

156. METHOD OF FEEDING THE BOLT IN LATH MACHINES; James Nevison, Morgan, Ohio.

Claim—The wedge rack riding on an inclined plane, in combination with the arms provided with the spur wheel, ratchet wheel, and ratchet, for the purpose of elevating the log and giving it a throw, and also for holding it in place during the stroke of the knives.

157. SAFETY ATTACHMENT FOR RAILROAD CARS; H. A. Newhall, Newton, Massachusetts.

Claim—The supplementary platforms or treads, formed of the rods fitted in tubes attached to the platforms, the rods bearing against springs in the tubes, in combination with the side guards formed of the vertical rods attached to the bars, and the chains which are connected to rods, and the railing or guards of the platforms.

158. PREPARATION OF FIBRE FOR PAPER PULP; Martin Nixon, Philadelphia, Pennsylvania.

Claim—1st, The manner of applying the steam, whereby the solution is automatically and continuously delivered on top of the straw. 2d, The process of boiling whole straw by the combined arrangement of an upward current of steam, and downward current of alkaline solution, permeating the mass and acting upon it in conjunction.

159. SLICING APPLES; H., J., and B. Norton, Farmington, Maine.

Claim—The combination of reciprocating frame provided with the knives and pressure bar, with the intermittingly rotating arbor.

160. BURNERS FOR VAPOR LAMPS; John K. O'Neil, Kingston, New York.

Claim—The arrangement of the burner beneath the vaporizing tube or chamber, in such a manner as to be movable or adjustable to different distances therefrom, whereby the amount of light produced and of vapor generated may be exactly and in all degrees regulated simultaneously, and be mutually dependent on each other.

161. CORN PLANTERS; L. B. Phelps, Geneva, Ohio.

Claim—The arrangement of the adjustable furrow openers, handles, lever, and spring catches with runners.

162. LATHE DOG; Nathan M. Phillips, City of New York.

Claim—The lathe dog having its body formed of one piece and having an aperture in which the follower operates.

163. MANUFACTURE OF ARTIFICIAL WHALEBONE; C. Poppenhusen, City of New York.

Claim—Subjecting it to mechanical pressure after it has been saturated with linseed oil, or equivalent substance, and whilst the oil, or other equivalent saturating substance, is in the viscid state.

164. APPARATUS FOR CLEANING THE COULTERS OF PLOUGHS; Abner Reeder, Wrightstown, Pennsylvania.

Claim—The spring sliding rod with any convenient number of prongs, when connected and arranged on the plough.

165. SEEDING MACHINES; L. Robinson, Melrose, Massachusetts.

Claim—The reciprocating slide, in combination with the supplementary or auxiliary perforated slides, one or more pairs.

166. SELF-LIGHTING AND EXTINGUISHING LANTERNS; A. Roesler and C. Frey, Warsaw, Illinois.

Claim—1st, The box provided with spring, plates, springs, and arms. 2d, The slide, rods, in combination with arms. 3d, The supporters, plates, catch, rod, in combination with the extinguisher.

167. STREET SWEEPING MACHINES; Andrew J. Roberts, Boston, Massachusetts.

Claim—1st, Hanging the brooms or brushes in a swinging frame on centres, so arranged that it can be readily leveled and adjusted as fast as the brooms become worn. 2d, The combination of devices whereby the brooms are raised or lowered, and at the same time the communication between the driving power and brooms established or cut off, the same consisting of the bent lever arm, short arms, and pulleys. 3d, Attaching the spring plates to a swinging movable frame which is raised and lowered with the brooms, whereby the said springs are raised from the ground when the brooms are not in use, and adapt themselves closely to the surface of the ground, and press against the same when the brooms are at work, thereby preventing, by the weight of the brooms acting upon the springs, the vibrating or "bobbing motion," which otherwise the broom would receive. 4th, In combination with the studs in the driving wheels, the circular grooved pulleys.

168. APPARATUS FOR BAKING AND COOKING; W. G. Ruggles, Worcester, Massachusetts.

Claim—The arrangement of the flue or flues with the slides and openings.

169. DEVICES FOR REGULATING BY ELECTRICITY THE ISSUE OF GAS FROM BURNERS; Charles W. Smith, Evans, New York.

Claim—The combination and use of a permanent and temporary magnet, and of two temporary magnets, one fixed and one vibratory, with a pawl and ratchet situated upon the supply cock of a gas burner or series of burners. Also, the use of a thin slip of metal, or its equivalent, to deflect a portion of the jet of gas upon an ignited platina coil, situated entirely without the jet.

170. MACHINE FOR AFFIXING POST-OFFICE STAMPS TO LETTERS; George K. Snow, Watertown, Massachusetts.

Claim—The combination of feeding mechanism, shearing or cutting mechanism, a platen and bed applied

together, so as to constitute a machine for affixing postage stamps to letters. Also, the arrangement of the feeding mechanism, the platen, and the shear or shears with respect to the lever and the bed, whereby the reciprocating motions of the lever results will take place. Also, the gauge, in combination with the bed or the table, and the post-stamping mechanism. Also, combining with the post-stamping apparatus, or in one frame with it, a means of damping or wetting the surface or that part of a letter on which a stamp is to be affixed.

171. BOOT-JACK; O. S. Sikes, Suffield, Connecticut.

Claim—The arrangement of the clamps, spring, and pins.

172. MOULDING FRAME FOR THE CONSTRUCTION OF BOATS; Nathan Thompson, Jr., Brooklyn, New York.

Claim—A frame capable of supporting and confining in proper relative position the various parts that make up the frame of a boat; and in combination with such a frame, means for holding the frame in proper necessary positions, and admitting of an easy change from one position to another. Also, in combination with such a frame, lifting screws passing through the gunwale frame.

173. TIPS FOR FISHING RODS; J. C. Underwood and T. J. Bargis, Richmond, Indiana.

Claim—Attaching the pulley to the top of the rod through the medium of the socket, or its equivalent, so arranged that the pulley is prevented from turning entirely around the tip, and the line thereby prevented from winding around the rod, and at the same time the pulley allowed to adjust itself so that the plane of its rotation may at all times be made to coincide with that of the line.

174. GRINDING MILLS; S. Vascow and A. Guiraud, Cincinnati, Ohio.

Claim—The combined arrangement of the braking rollers with the cylindrical grinder and concave, for adjusting the cylinder and concave apart for grinding.

175. SECURING METALLIC BANDS ON COTTON BALES; P. C. Ingersoll, Assignor to self and H. F. Dougherty, Green Point, New York.

Claim—The batten pivoted to the plate provided with openings, the batten being provided with recesses at its ends.

176. NAIL MACHINE; John L. Krauser, Reading, Assignor to self and James Harper, Philadelphia, Penna.

Claim—Forming a groove or grooves in the anvil cutter to receive the flanch or flanches on the nail plates. Also, in combination with a vibrating anvil or anvil cutter, the placing of the cutting edge of said cutter at or near the centre of motion of said vibration. Also, the rims or adjustable sections on the perimeter of the rotating cutter wheel, for regulating the size of the nail to be cut. Also, in combination with a rotating cutter wheel and a vibrating anvil, the inclination given to said anvil and its cutter.

177. DEVICES ATTACHED TO HAND SAWS FOR SQUARING AND MARKING; H. Smith, Camden, New Jersey, Assignor to H. Disston, Philadelphia, Pennsylvania.

Claim—1st, Riveting the shoulder strips directly to the blade and independent of the handle. 2d, The combination of the sharpened projection with the graduated saw blade.

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178. VALVE COCK; Seth Adams, Boston, Massachusetts.

Claim—My improved disk valve cock, with one coupling pipe seat, disk valve, and valve chamber, so that when the valve may be raised above the bore of the coupling pipe, and a column of fluid may be passing through the said pipe, such column shall flow through the said pipe and valve chamber in a line with the axis of the pipe, or in a straight line, and enter the valve chamber at one side and pass out of its bottom, or enter at its bottom and pass out of its side, and through an opening of the valve seat, whose sectional area shall be equal to, or greater than, that of the bore of the coupling pipe.

179. BREECH LOADING RIFLE; Charles Wm. Alexander, Moorefield, Virginia.

Claim—The replacable rifled cylinder, with its dove-tail for cap and notch for holding it in its place, in combination with the revolving chamber that bears it and holds it to its place.

180. FURNACE GRATES; Albert J Allen and Wm. S. Hudson, Paterson, New Jersey.

Claim—The combination together of the vertically moving furnace bars furnished with projections.

181. DRIVING-WHEELS FOR PORTABLE STEAM ENGINES AND AGRICULTURAL IMPLEMENTS, &c.; George W. Barnett, Springfield, Ohio.

Claim—Providing a wheel with one or more series of radial elastic feet.

182. STEAM BOILERS; George W. Barnett, Springfield, Ohio.

Claim—In combination with a furnace arranged centrally within the boiler, the smoke flues and exhaust pipes, when so arranged that the smoke and waste heat of the furnace, as also the exhaust steam, shall be conducted together downwards through the water in the boiler in the same pipes.

183. COMPOSITION FOR VARNISHING LEATHER; Obadiah S. Boyden and M. C. Frederick, Newark, New Jersey.

Claim—The employment in the compounds used in the manufacture of glazed, japanned, or painted leather, cloth, silk, and paper, either wholly or in part, as a substitute for camphene or spirits of turpentine, of a paste made of the glutinous properties of flax seed.

184. SOUNDING APPARATUS; Richard F. Bridwell, St. Louis, Missouri.

Claim—The use of a lever applied to the bow of a vessel so constructed, combined, or arranged as to vibrate in either direction.

185. HOISTING ICE; Wm. G. Brower, Staatsburgh, New York.

Claim—The receptacle or box connected with the drum or windlass by the chain or rope, the drum or windlass being fitted loosely on the driving shaft, and connected with, and detached from, it at the proper time by means of the clutch actuated through the medium of the sliding bars, spring, and lever catches, so that the several parts will operate automatically by a continuous motion of the driving shaft.

186. LATHES; Jared T. Bunce, East Haddam, Connecticut.

Claim—Constructing the slide rest of two parts, so that the one part may have a movement independent of the other, in combination with the nut formed of two parts, and used in connexion with the worm wheel, which is actuated simultaneously with the parts of the nut.

187. VAPOR LAMP BURNERS; Daniel H. Carpenter, City of New York.

Claim—Regulating the quantity of air to be mixed with hydro-carbon vapor, consisting of the screw stop

placed in the tube at such distance below the exit aperture as shall leave the requisite space for the mixing of the gases before reaching said aperture. Also, the construction of the valve for the vapor passage, whereby the said passage is kept free at all times without increasing the size thereof.

188. HARROWS; Vasco M. Chaffee, Grayville, Illinois.

Claim—The combination of the side pieces, a cross-bar, or their equivalents, with the rotating harrowing wheels.

189. DEVICE FOR ACTUATING THE INDEX OF HYGROMETERS; Charles L. Clark, Rochester, New York.

Claim—The combination of the slotted weight with the shaft, whereby the shaft is actuated by the horizontal rotation of weight, without obstructing the vertical movement of the latter.

190. HOMINY MILLS; James M. Clark, Lancaster, Pennsylvania.

Claim—1st, The arrangement of the apertures and, in the conveyer case, with the slide valve. 2d, The combination of a movable or stationary conveyer with, and formed on, the shaft of the bolting reel, for the purpose of conveying the material into the bolt to any required distance to effect the object.

191. RECIPROCATING PADDLE; Peter C. Clark, Reading, Pennsylvania.

Claim—The arrangement of the lever, having an adjustable paddle, with the radius bar and crank arm, in their relation to each other and to the crank shaft.

192. FLOURING MILLS; Edwin Clark, Lancaster, Pennsylvania; ante-dated February 2, 1858.

Claim—The valve or series of valves, with their perforations, in combination with the apertures in the bolting chamber, so as to make said valves common to the three different transits of the ground material. Also, in combination with the circular division, the inclined planes for properly conducting that portion of the material that falls upon the space between them into its proper channel.

193. MACHINE FOR GUIDING SAWS; Wm. Clemson, East Woburn, Massachusetts.

Claim—The employment of a revolving friction clamp applied to the saw to receive rotary motion from the saw, and to control the revolution of the saw by the momentum it acquires by such rotary motion.

194. LUBRICATING CAR AXLES; John W. Cochran, City of New York.

Claim—The arrangement of the rollers upon the coil, said coil having within it a shaft or rod of metal or wood, with the rods attached to studs in their relation to each other and to the box and axle.

195. VALVE PROPELLER; Aaron Colton, Le Roy, New York.

Claim—The connexion of the paddles with the sliding frames and the flat plates, in combination with the stops.

196. BURGLARS' ALARM LOCKS; Addison Corey, Casstown, Ohio.

Claim—The application to door locks of the insulated knob, these extra bolts, levers, and springs, in this arrangement with any lock, and these several galvanic attachments in combination with the lock, which will produce the intended effect.

197. HARVESTERS; J. H Conklin, Rockford, Illinois.

Claim—1st, The vibrating divider, in combination with the cutting apparatus, whereby the grain is gathered into the cutters in order that the parts of the machine following after may perfectly clear the standing grain. 2d, The curved or turned up and slotted ends of the finger bar, in combination with a vibrating lever.

198. WATER WHEELS; John Custer, Finley, Ohio.

Claim—Placing the plate loosely on the shaft, and rendering the same adjustable thereon, by means of set screws, or their equivalents, in connexion with the adjustable mouth in the sluice. Also, the buckets, so that the percussion force of the water is obtained, and also the force produced by its weight as it passes from the buckets, and the water at the same time allowed to pass in a very direct and uninterrupted manner through the buckets, so as not to occasion much loss of power by friction.

199. WIND WHEELS; Wm. H. Derrick, Stockton, California.

Claim—The movable or traversing vane, with weight attached, in combination with the permanent or stationary vane.

200. LEVELING DEVICE ATTACHED TO HAND SAWS; H. Disston and T. L. Morss, Philadelphia, Pennsylvania.

Claim—Placing the two spirit tubes or levels in the handle of the saw relatively with each other and the back edge of the saw.

201. WINDOW SPRING; Edward Doen, New Britain, Connecticut.

Claim—The combination of the independent obtuse angled lever and direct-acting spring bolt, arranged for action together relatively to each other and the face plates of the casting which carries both, and for connexion with the window casing as a fastener to the sash.

202. RAILROAD CAR BRAKES; C. H. Eisenbrandt, Baltimore, Maryland.

Claim—The manner or mode of direct application to the axles of wheels, of the lever and screw, with the clasping boxes, griping collars, and the pivot and socket axles, the pendant bearings, with the box seats, —the connecting yoke eye rods, the ear guides, the whole arranged, combined, and operated with the other devices.

203. KNIFE POLISHER; H. T. Field, New Braintree, Massachusetts.

Claim—The combination of the annular buffers with the disks, when arranged on the adjacent faces of both disks.

204. CARPET FASTENER; W. Filkins, Lancaster, New York.

Claim—The arrangement of the horizontal swinging slotted cap with the plate and the spur.

205. GANG PLOUGHS; J. Frye, Mendota, Illinois; ante-dated March 18, 1858.

Claim—The attachment of the tongue to the forward and rearward plough stocks, and the connexions between the various plough stocks, so that when the team is turned the ploughs shall be turned so as to point towards a common centre. Also, the connexion of the forward furrow wheel with the tongue, by means of the curved slotted arm and bolt, in combination with the crank and connecting rods between the wheel shafts, so that when the team is turned, the forward wheels shall be turned in the same direction, and the rear furrow wheel shall be made to track the forward wheels. Also, hanging the hinged coulter to the rear of the front furrow wheel, by means of a chain which, when the team is turned, will raise said coulter out of the furrow.

206. APPARATUS FOR CATCHING FISH; Jacob Garl, Suffield, Ohio.

Claim—The sliding trigger, the notch, key, nut, as applied to a machine for catching fish.

207. MACHINE FOR TURNING IRREGULAR FORMS; N. J. Glover, Waveland, Indiana.

Claim—Two traversing and vibrating cutters arranged to work on the opposite sides of the piece of wood turned. Also, arranging the nuts or racks of teeth (upon which the screw acts to traverse the cutters,) upon the cutter bars in such a way and manner, that when the cutters are brought into action, the racks will be brought to the screw so as to traverse the cutters, and when the cutters are thrown out of action, the racks which traverse them are released from the screw.

208. CUTTER HEAD AND TABLE REST FOR CUTTING IRREGULAR FORMS; J. P. Grosvenor, Lowell, Massachusetts.

Claim—1st, The rest, in combination with a cutter head. 2d, Securing the cutters to the head by means of grooves in the collars, when the cutters are set in planes forming angles with each other.

209. CHEESE PRESSES; Jacob Hibbard, Weathersfield, New York.

Claim—The combination of the levers, connecting rods, weight, and follower.

210. MANUFACTURE OF DEXTRINE AND SUGAR; T. A. Hoffman, Beardstown, Illinois.

Claim—The combination of steam and acids for converting starch, corn, or other cereals, into dextrine gum, or sugar, when said grain is subjected to the action of diluted acids, and the temperature of the mass is elevated to 225 or 300 degrees Fahrenheit.

211. THERMOSTAT; S. Holton, Jr., Middlebury, Vermont.

Claim—The slotted plates, carrying the pin, and the notch in which it works applied to the compound bar and to the lever, to vary the effective length of one arm of said lever, and yet preserve its proper relation to the compound bar.

212. OMNIBUS REGISTER; R. E. House, Binghampton, New York.

Claim—The combination of a step protected, resting on a yielding support, such as a spring, or its equivalent, with recording mechanism to be operated by the step.

213. WIND-WHEELS; James B. Johnson, San Francisco, California.

Claim—Constructing the wind-wheel with stationary and adjustable sails.

214. APPARATUS FOR SEPARATING THE COMBUSTIBLE FROM THE INCOMBUSTIBLE GASES OR PRODUCTS OF COMBUSTION IN FURNACES, &c.; W. D. Jones, Hagaman's Mills, New York.

Claim—The box with its inlet, separating diaphragm, chambers, pipe or passage, and two fan blowers.

215. IRON GATE OR FENCE POST; T. E., A., and E. King, Cherry Valley, Ohio.

Claim—A fence post composed of the parts, provided with toothed or serrated edges, arms, and keys, and in combination therewith the wings and stud. Also, the manner of securing the gate hinges, by means of the lugs and notches, the same being held in place by the keys.

216. PRODUCTION OF ELECTROTYPE PLATES; Silas P. Knight, City of New York.

Claim—The treatment of the plumbago coated moulds with a solution of the sulphate of copper and the dust of iron, by which a metallic film is produced.

217. MARINE ALARM AND FOG SIGNAL; L. Lewenberg, City of New York.

Claim—The hollow cylinder or drum open at the ends and fitted with the ribs or plates, when arranged to act on and within the circular ranges of metallic springs attached to the rings.

218. PREPARING PAPER PULP FROM REEDS; Henry Lowe, Baltimore, Maryland.

Claim—The process of making paper pulp from reeds, by first disintegrating the reeds by boiling in a solution of caustic soda accompanied by agitation, and then reducing them directly to pulp without reducing to half stuff by the machine technically called the old rag engine.

219. PROTRACTOR; Josiah Lyman, Lenox, Massachusetts.

Claim—1st, The arrangement of the several verniers, limbs scales, and rule in one instrument. 2d, The peculiar arrangement of the sliding vernier scale, by which it can be applied with equal readiness and facility to either side of the rule, so as to read the given angle and its complement.

220. SEEDING MACHINES; Joseph McCammon, Dayton, Ohio.

Claim—The blade attached to the rotating shaft which is placed within the hopper or seed box, in combination with the adjustable slides and concave bottom.

221. SEEDING MACHINES; G. M. L. McMillen, Dayton, Ohio.

Claim—The employment or use of the shaker, placed between the rotating flanches, and operated by the curved rod and cam, the sliding plates, gauge, and cylinders.

222. FOOT CLEANER; Allan McKeachnie, City of New York.

Claim—The scraper, in combination with the rotary brushes and elastic rotary brushes, with or without the cleaners, the above parts being placed within a suitable shell or basin.

223. CORN HUSKERS; B. B. Meacham, Ridleyville, Florida.

Claim—The wheel, grooved circumferentially and provided with the knife or cutter, forked plate, and oblique partition or ledge, and arranged relatively with the spouts.

224. STRAW CUTTERS; Oren Moses, Malone, New York.

Claim—The arrangement of the bridle pieces or connecting plates attached to cleaning comb, with driving shaft and journals of feeding rollers, the whole being constructed for operation conjointly with feed box, rest, shaft, disks, and knives.

225. BED BOTTOM; James M. Noble, Delhi, Iowa.

Claim—The pulleys attached to two opposite sides or ends of the bedstead by cords, straps, or equivalent means, so as to admit of the free turning of the pulleys and the twisting of the same in planes at right angles with their plane of rotation, in combination with the rope which is strained around the pulleys. Also, in combination with the pulleys and rope, the elastic bands.

226. JOURNAL BOXES; James A. Norris, Philadelphia, Pennsylvania.

Claim—1st, The combination of the glands, &c., with a box having stuffing boxes formed in each end. 2d, Arranging a packing between the adjacent sides of the box, whereby the entrance of any dust between said sides is rendered impossible.

227. Clothes Pin; D. Pierce, Sunapee, New Hampshire.

Claim—A new article of manufacture, to wit: a clothes-pin.

228. Washing Machine; F. B Pratt and F. Tylee, Cleveland, Ohio.

Claim—The fluted brake when attached to yielding bearings, parallel with fluted roller, in combination with the united open flapped and endless aprons.

229. Seeding Machines; A. M. Pratt, Lowell, New York.

Claim—Attaching the furrow and covering shares respectively to shafts, which are allowed to turn in their bearings, and are used in connexion with the shaft attached to the lever, crank, and lever, which support one end of the seed distributing shaft.

230. Railroad Switch; N. Pullman, New Oregon, Iowa.

Claim—1st, The combination of the bent switch rail with the shoe. 2d, The combination of the curved blocks with the shoe and the switch rail, for the purpose of regulating the inclination of the switch rail to the track, and also its angle of divergence from the track.

231. Governor for Horse Power; Lea Pusey, Wilmington, Delaware.

Claim—The loaded levers or sliding weights provided with brakes, connected by a spring and rods, and attached to an independent rotating disk or rotating arms, or to the fly-wheel of the machine to which the device is applied, in combination with a stationary or revolving rim.

232. Washing Machine; A. Quimly, Terre Haute, Indiana.

Claim—The combination of the approximating plungers with the revolving tub, whereby the clothes are subjected to a continuous rotary action and at intervals to a squeezing or expressing action, and thereby thoroughly washed.

233. Flouring Mill; C. Rands, Peoria, Illinois.

Claim—1st, The combined arrangement of the upper and lower stones, reduced from their centre outward to mere rim grinding surfaces comparatively, two annular non-grinding plates, one or both concave, placed over the enlarged eye of the stones, and the horizontally revolving fan or blower, arranged intermediate between the stones, and crossing vertically the space existing between the same, so as to force the grain with a direct action out to the grinding surface, and to give a direct biast. 2d, The fan when constructed with its blades radial, and situated in the specified relation to the space existing between the stones, so as to give a direct blast. 3d, In combination with the above, the arrangement for suspending the stones, consisting of rings, each having four axes, and one being arranged on the spindle of the stones, and the other between the standards of the frame. 4th, The combination of the spirally flanched, revolving, and sliding cylinder, friction wheels, and spindle.

234. Apparatus for Distilling Spirit of Turpentine; Daniel Reid, Washington, North Carolina.

Claim—The employment in connexion with the still of a steam box constructed with strainers, and of such form and capacity as to receive the barrels of crude turpentine.

235. Lifting Jacks; A. C. Richard, Newton, Connecticut.

Claim—The standard provided with screws and pinions, in combination with the traverse bar and the adjustable friction rollers.

236. Lamps for Burning Coal Oil, &c.; George Rimmington, South Brooklyn, New York.

Claim—The cap formed of two parts, perforated and used in connexion with the two tubes, the several parts being arranged relatively with each other and applied to the lamp.

237. Life Boat; A. L. Shears, Omro, Wisconsin.

Claim—The arrangement of the sides as constructed with the hull proper of the boat forming the air chambers, and being open below, and these sides and air chambers combined and arranged with the scuppers and valves.

238. Gas Retorts; J. T. Sloan, V. Smith, M. Hoover, and R. M. Briggs, Jackson, California.

Claim—The employment in the manufacture of gas from wood, of a cylindrical retort placed horizontally and having a door to close the opening for the reception of material, swinging upon hinges and shutting with staple and eye to receive a wedge, the other end being closed with a clamp and wedge.

239. Combined Rocking Chair and Cradle; A. S. Smith, Lawrence, Massachusetts.

Claim—The adjustable back and foot-rest, connected by the levers and arranged relatively with the seat, and used in connexion with the rockers connected to the legs by the swivel sockets.

240. Seed Drills; J. C. Stevens, Lee, Massachusetts.

Claim—Connecting the bars or beams to the frame of the machine by means of joints to prevent the front and converging ends of the boxes from coming in contact with each other when raised, and using in connexion with the bars or beams thus hinged, a distributing mechanism, so that the distributing device will be thrown out of gear with the wheels simultaneously with the elevating of the bars or beams, and consequently the teeth.

241. Raking Attachment to Harvesters; J. A. St. John, Jamesville, Wisconsin.

Claim—The particular means employed for operating the rakes, viz: the reciprocating slide, arm, crank-shaft, with the rakes attached, in connexion with the lever, pinion, and segment.

242. Wrench; George C. Taft, Worcester, Massachusetts.

Claim—Arranging the lowermost screw to work in a screw rack on the shank of the wrench, and providing the said screw with a cylindrical slider extending below it, and operating so as not only to turn around, but move longitudinally with the screw and in a socket piece connected with the handle.

243. Feed Regulator for Steam Boilers; L. Thom, City of New York.

Claim—Making the stem or arm of a hollow float which is applied to the cock with a passage through it, connecting with a passage leading through one end of the plug of the cock, and thereby forming a communication from the interior of the float to the atmosphere.

244. Attachment for Opening and Closing Doors, &c.; A. W. Webster, Waterbury, Connecticut.

Claim—The levers pivoted to the lintel of the casing or the sill thereof, the inner ends of the levers gearing into each, and the outer ends connected by the arms to the doors or shutters.

245. PORTABLE SODA WATER APPARATUS; E. D. Wheeler, Murfreesboro', Tennessee.

Claim—Inclosing the charge in a long fibrous case or bag, when said case or bag is used in combination with a soda water apparatus.

246. COMPOSITIONS FOR ARTIFICIAL LEATHER; Samuel Whitemarsh, Northampton, Massachusetts.

Claim—The fabric within, composed of cotton, or other fibrous substances, in a woven or unwoven condition, saturated or coated with a compound of linseed oil and burnt umber that has been prepared.

247. CHANGING ROTARY INTO RECIPROCATING MOTION; S. L. Wiegand, Philadelphia, Pennsylvania.

Claim—1st, The oblique wheel adjustable on an axis transverse to the revolving shaft. 2d, Giving a permanent lead to the motion by a permanent inclination of the wheel, in combination with a variable inclination. 3d, Conveying the vibratory motion to the rods, by means of ball and socket or universal joints, when said joints are used in combination with the frame.

248. POWER AND HAND DRILLS; H. Woodman, Biddeford, Maine.

Claim—1st, Constructing an eye or box in the upper end of the post, in combination with the hollow shaft and spindle frame, whereby the spindle carried by the frame may be set and operated at any required distance from an angle to the said post. 2d, The combined arrangement of the hollow shaft, frame, gears, and spindles, and with their projecting ends, whereby the drill spindle may be driven either directly or through the medium of shaft and bevel gears. 3d, The arrangement of the removable platen or face plate with the sliding clamp jaws, collar, and set-screw.

249. VAPOR LAMPS; Horatio Bateman, Boston, Assignor to Wm. F. Bateman, Harvard, Massachusetts.

Claim—Constructing the spur or tongue with a suitable eye for the insertion and retention of the wick.

250. MACHINE FOR CUTTING PIPE; Michael Bower, Assignor to self and Geo. B. Waterhouse, Charlotte, N. C.

Claim—In combination with the cutters, the two revolving disks with their series of holes, the holes of one disk being furnished with loose sleeves or rings for the purpose of adapting the machine to the cutting off of pipes of various sizes.

251. STEAM TRAP VALVE; J. W. Hoard, Assignor to self and G. B. Wiggin, Providence, Rhode Island.

Claim—The construction of the valve, with a metal stem, part of which is hollow and communicates with the hollow interior of the valve, and is fitted with a hollow cap, which also serves as a nut to secure the valve against longitudinal expansion, whereby provision is made for filling it with liquid and confining such liquid therein.

252. STOVES; Charles Hoofstatter, Assignor to Joseph Firman, Rome, New York.

Claim—The flues and partitions in connexion with the ovens.

253. METHOD OF EXTRACTING TEETH; Jerome B. Francis, Assignor to Wm. Harper, Jr., Assignor to Jerome B. Francis, Assignor to James J. Clark, Philadelphia, Pennsylvania.

Claim—The combination of the electro-magnetic machine, or its equivalent, with the dental forceps, for removing teeth without pain.

254. KNIFE CLEANERS; Wm. Miller, Waltham, Massachusetts, Assignor to self and Daniel S. French, Waltham's Mills, New York.

Claim—The shelves.

255. RAILROAD CAR COUPLINGS; Allen Lapham and Daniel H. Burns, Brooklyn, New York, Assignors to selves and Charles A. Durgin, City of New York.

Claim—A tilting hook and lever acting in combination, whereby the coupling mechanism is rendered automatic and capable of being disconnected instantaneously, irrespective of the tension or draft of cars.

256. ROTARY LAST HOLDER; David Philbrick, Manchester, New Hampshire, Assignor to Elmer Townsend, Boston, Massachusetts.

Claim—My improved support piece of the radial arm, viz: as made of a standard and plate, and a circular plate, formed to enter the recess of the plate and to make with such a dove-tail groove, or its equivalent, for receiving the head of the clamp screw, the two plates being confined together by a screw and nut. Also, the improved last holder, hinge and clamp, viz: with its clamping and hinge pin, constructed with a head to bear against one end of the male part of the hinge, and to turn and be supported in one of the prongs of the fork of the hinge.

257. HARVESTERS; Wm. H. Seymour and Henry Pease, Assignors to Wm. H. Seymour and Dayton S. Morgan, Brockport, New York.

Claim—The arrangement of the tongue on a pivot in advance of the cutter, and in a guide provided with a detent in rear of the cutter, so that the attendant can conveniently and readily by means of the link raise the cutter by lifting directly the rear end of the tongue.

258. CASTING FAUCETS; Oliver T. Wood, Pittsburgh, Assignor to Thomas R. Wood, Philadelphia, Penna.

Claim—Constructing faucets by placing the spigots within a mould formed for the tubes of the faucets, and casting the tubes around the spigots.

259. RAILROAD BRAKES; Joseph Harris, Alleghany City, Pennsylvania.

Claim—1st, The combination of the cross-arms on each of several cars, with a chain shaft on one car connected by chains, rods, or ropes, for the purpose of adjusting and operating the brakes. 2d, The combination of the tumbler with the extension shafts, the purchase rods, and springs, to act automatically as a railroad brake.

RE-ISSUES.

1. SYRUP CASTORS; Edmund Bigelow, Springfield, Massachusetts; patented April 6, 1858; re-issued May 4, 1858.

Claim—The combination of a self-measuring faucet and air tube with each of two or more reservoirs for syrups, or like fluids, the reservoir being on a common base forming a castor.

2. HARVESTERS; Charles Crook, New Hope, Pennsylvania; patented March 5, 1857; re-issued May 4, 1858.

Claim—1st, Operating and changing the speed of the cutters, by means of the internally geared wheel and spur wheel, in combination with the pinion. 2d, Connecting the rod to the end of the lever, by means of the swivel joint, when said joint is situated at or near the centre of vibration of the cutter frame.

8. BAGASSE FURNACES; Abraham Hager, Baton Rouge, and Youngs Allyn, New Orleans, Louisiana; patented May 6, 1856; re-issued May 4, 1858.

Claim—Inserting in the furnace a skeleton dome rising above the exit flue, so as to arrest the fall of the wet bagasse, and for a limited time retain it above the fire, without obstruction to the draft of the furnace.

4. BOXES FOR RECEIVING PASSENGERS' FARE; John B. Slawson, New Orleans, Louisiana; patented July 28, 1857; re-issued May 4, 1858.

Claim—A fare-box having two compartments, into one of which the fare is first deposited and temporarily arrested previous to its being deposited in the other, when the former is provided with glass sides so arranged that the passenger can see through one, and the driver or conductor through another.

5. ARITHMOMETER FOR ADDING; O. L. Castle, Upper Alton, Illinois; patented November 24, 1857; re-issued May 11, 1858.

Claim—1st, The combination of the repeater, the stationary repeater stop, the sliding stop bars, &c., and the stationary stop pin with the driving-wheel, or its equivalent, provided with a series of holes. 2d, Combining the shaft of the driving-wheel, or its equivalent, with the keys, &c., by means of a stronger spring, and a weaker spring, and a lever deriving motion from the keys. 3d, Combining the keys with the sliding stop bars, &c., by means of the wedges attached to the keys, the arms sliding on guide bars, and the collars and springs applied to the guide bars. 4th, The loose teeth applied to the wheels. 5th, Making the "register" movable longitudinally relatively to the driving-wheel, for the purpose of changing the driving operation to the register wheels of different denominations at pleasure.

6. SAWING MILL; Wm. Hawkins and Wm. C. Clary, Milwaukie, Wisconsin; patented March 30, 1858; re-issued May 11, 1858.

Claim—Changing the saw after each cut alternately from an oblique position in one direction to an oblique position in a contrary direction, to the line of the log carriage while cutting in either direction by the movements of the machine. Also, the swing guides, in combination with the stationary guides. Also, the two wedge rollers or wedges, and to keep the board clear of the saw while cutting in either direction. Also, the combination of pinions and their pins entering into recesses of plates, the ratchet wheels, the ratchets, the adjustable segments, the wheels, the screws, and the rods, with their clutches, and for the purpose of setting the dog to the saw, and stopping the setting when the log frame advances too close to the saw. Also, the notched plate, in combination with the latch, lever, and link, for the purpose of operating the belt shifter without turning the lever.

7. SEED PLANTERS; B. Kuhns, Dayton, Ohio, and M. J. Haines, Delaware City, Delaware; patented September 30, 1856; re-issued May 11, 1858.

Claim—The pocketed roller running close to the bottom of the cell, in combination with the adjustable aperture in said cell bottom, when the relation between the width of the pocket and maximum size of the aperture is such that the pocket will always embrace the aperture.

8. SEEDING MACHINES; C. W. Cahoon, Assignor to J. B. Cahoon and D. H. Furbish, Portland, Maine; patented September 1, 1857; re-issued May 11, 1858.

Claim—1st, The employment of a tubular chamber or discharger, rotating rapidly in a horizontal position, so that its outer edge or periphery will be in a plane vertical, or nearly vertical, to the horizon, and thereby communicating a centrifugal motion to the grain, seed, &c., away from the centre of a circle whose plane is thus vertical, or nearly vertical, to the horizon. 2d, The employment of a funnel-shaped discharging chamber having spiral flanches, or their equivalents, inserted therein, and operating to arrest the too direct flow of the grain or seed, &c., through the discharger, and retaining it therein until the necessary centrifugal force is communicated to it before it leaves the discharger. 3d, The combination of the claimed tubular or funnel-shaped discharging chamber with the disk. 4th, The combination of the claimed tubular or funnel-shaped discharging chamber, whether with or without the use of the disk, with a hopper constructed of any proper material, and fitted with the slide and rock shafts with teeth attached, or their equivalents, to feed the grain, seed, &c., into the discharging chamber.

9. MACHINERY FOR SEPARATING FLOUR FROM BRAN; Issachar Frost and James Monroe, Albion, Michigan, Assignors to Henry A. Burr, Israel D. Condit, Alexander Swift, Daniel Barnum, and John M. Carr, City of New York; patented February 27, 1849; re-issued March 13, 1855; re-re-issued May 11, 1858.

Claim—1st, The vertical, or nearly vertical, position of the bolt. 2d, A surrounding case forming a chamber or chambers around the bolt, and provided with suitable means for the delivery of the flour. 3d, A rotating distributing head at or near the upper end of the bolt. 4th, Rotating beaters or fans within the bolt. Also, in combination with the 1st, 2d, and 4th features of the combination first claimed, the closed up top of the bolt, except an aperture or apertures for the admission of the material and air. Also, in combination with the 1st, 2d, and 4th features of the combination first claimed, the closed up bottom of the bolt proper, except an aperture or apertures for the discharge of the bran; whether the said bottom be or be not specially provided with an aperture or apertures for the admission of air. Also, in combination with the third combination claimed, or the equivalent of the features thereof, the employment of rotating arms or wings moving in close proximity with the inner surface of the closed up bottom. And finally, the combination of all the features as essential features, or any equivalents, for any or all the said features.

10. MANUFACTURE OF INDIA RUBBER; Henry B. Goodyear, City of New York, Administrator of Nelson Goodyear, deceased; patented May 6, 1851; re-issued May 18, 1858.

Claim—The combining of sulphur and india rubber, or other vulcanized gum, in proportions, when the same is subjected to a high degree of heat, according to the vulcanizing process of Charles Goodyear, for the purpose of producing a substance or manufacture possessing the properties or qualites: and this I claim whether the said compound of sulphur and gum be or be not mixed with the other ingredients.

11. MANUFACTURE OF INDIA RUBBER; Henry B. Goodyear, City of New York, Administrator of Nelson Goodyear, deceased; patented May 6, 1851; re-issued May 18, 1858.

Claim—The new manufacture, and possessing the substantial properties and composed of india rubber, or other vulcanizable gum and sulphur, and, when incorporated, subject to a high degree of heat: and this I claim whether other ingredients be or be not used in the preparation of the said manufacture.

12. MACHINE FOR SOWING FERTILIZERS; Warren S. Bartle, Newark, Assignor to Lyman Bickford and Henry Hoffman, Macedon, New York; patented April 22, 1856; re-issued May 18, 1858.

Claim—The combination of two or more vertical shafts provided with arms, with the outlet tubes of a machine for sowing fertilizers, &c.

13. Cooking Stoves; Austin Bronson, East Portchester, Connecticut; patented August 22, 1848; re-issued May 18, 1858.

Claim—The employment of the heat equalizing chamber interposed between the fire chamber and the oven, when used in combination with, and made to communicate directly with, the flues below the oven.

14. Sewing Machines; T. J. W. Robertson, City of New York; patented February 26, 1856; re-issued May 18, 1858.

Claim—Imparting the necessary motion to the looper, by means of the thread.

15. Cutting Device for Harvesters; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—Placing the blade or the cutting teeth of a harvesting machine on the vibrating bar to which they are secured, so that the said blade or cutting teeth may extend back and behind such bar.

16. Mowing Machines; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—1st, A cutting apparatus behind the driving-wheel of a machine adapted to mowing, when this is combined with a tongue or pole hinged, and with proper means for causing the cutting apparatus to run in close proximity with the ground. 2d, Arranging and combining the finger beam with the rear end of the main frame of the gearing, in such manner that while the portion of the finger beam to which the cutting apparatus is secured extends below the frame and may run close to the ground, the rear end of the frame will be carried above the stubble, and this relative position of the rear end of the frame of the finger beam and of the ground will not be disturbed by the rising and falling of the finger beam, or of the driving-wheel to follow inequalities in the surface of the ground in their respective paths. 3d, The combination and arrangement of a metallic shoe, the finger beam, and gearing frame.

17. Reel Supports in Mowing Machines; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—The method of supporting the reel upon the end of the finger beam without obstructing the action of the divider, by means of inclined arms.

18. Cutting Device for Harvesters; Henry Green, Ottawa, Illinois; patented March 21, 1854; ante-dated September 21, 1853; re-issued May 25, 1858.

Claim—1st, A vibrating cutter having any proper form of cutting edge in front, and notched or indented in the rear thereof, in combination with guard fingers across which it vibrates. 2d, The combination of a cutting edge at the front of a vibrating cutter for severing the stalks of grass or grain, with a cutting edge at the rear for cutting up and facilitating the discharge of obstructing matter.

Designs.

1. Cook Stoves; R. Wheeler and S. A. Bailey, Utica, New York; dated May 4, 1858.
2. Clock Case Fronts; Samuel B. Jerome, Waterbury, Connecticut; dated May 4, 1858.
3. Tool Boxes; Herrick Aiken, Franklin, New Hampshire; dated May 11, 1858.
4. Cook Stoves; T. H. Wood and J. E. Roberts, Utica, and H. S. Hubbell, Buffalo, New York; dated May 11, 1858.
5. Cook Stoves; S. W. Gibbs, Assignor to Rathbone & Co., Albany, New York; dated May 11, 1858.
6. Parlor Stoves; S. W. Gibbs, Assignor to Rathbone & Co., Albany, New York; dated May 11, 1858.
7. Stove Doors; Jacob Beesley, Assignor to John S. Clark and Washington Harris, Philadelphia, Pennsylvania; dated May 11, 1858.
8. Set of Printing Types; George Bruce, City of New York; dated May 25, 1858.
9. Towell Stands; Nathaniel Waterman, Boston, Massachusetts; dated May 25, 1858.

The claims on the above, are for the several shapes, forms, ornaments, and configurations.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

For the Journal of the Franklin Institute.

Improvement in Hand Saws. Patent granted to Henry Disston, of Philadelphia, Assignee of Hiram Smith, Camden, New Jersey, May 18, 1858.

This invention relates to an improvement in the combined hand saw and square, for which Letters Patent were granted to Jackson Gorham, of Bairdstown, Georgia, May 12, 1856; and the improvement consists in securing direct to the saw blade, and adjacent to, but independent of, the handle, certain metal strips which form the butt or stock of the square, so that the said strips may always remain at right angles to the upper edge of the saw blade, and may not be disturbed by any loos-

ening of the handle, which is secured to the blade by separate attachments. Above the upper edge and at or near the point where it meets the strips, is a sharp projection, from which to the end of the blade the latter is graduated into feet, inches, and suitable fractions of an inch, the sharp projection in conjunction with the graduated scale, serving to measure and mark off the measurement of lumber and other objects.

Fig. 1 in the annexed engraving represents a hand saw with H. Disston's improvement.

Fig. 2 a sectional plan on the line 1 2 (fig. 1).

A is the blade of the saw secured to the handle B, by the ordinary screws *a*. To each side of the blade is riveted a metal strip C, the handle fitting against the inside of the projecting flanches *c*, of the said

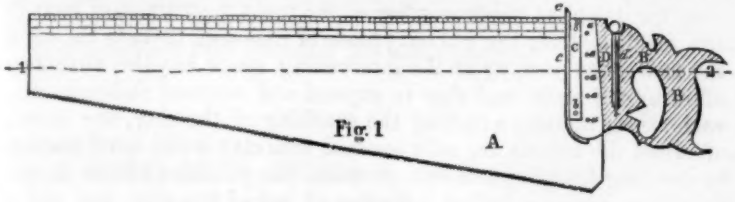


Fig. 1

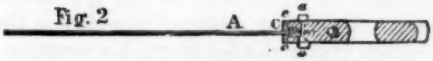


Fig. 2

strips, on each side. The outside of the projecting flanches are situated at right angles to the upper edge of the saw blade, which thus forms the blade of the square of which the strips C, are the butts. Continuations of the flanches *c*, project above the upper edge of the saw blade, both being reduced to a sharp cutting edge so as to form a marker. From this sharp edged projection the upper edge of the blade is graduated into feet, inches, and fractions of an inch.

In the handle B, is an orifice for the reception of a marker D, a spring *d*, secured to the bottom of the orifice serving the purpose of retaining the marker in its proper position within the handle when it is not required for use. In Gorham's patent, above alluded to, the handle of the saw is so constructed as to form of itself the butt of the square, and as it is apt through constant strains and hard usage to become loose, it is evident that when this occurs the instrument will cease to be of any utility as a square. By securing metal to metal, however, as above described, there is no danger of the strips C, moving from their original position, which cannot be changed by any loosening of the handle, inasmuch as the latter is secured to the blade by independent attachments. As the upper edge of the saw blade is graduated into definite lengths from the extreme end of the blade to the sharpened projection *e*, the latter must serve the very useful purpose of marking off the distances determined by the blade in measuring long pieces of lumber, and other objects, and the saw thus arranged will obviate the necessity of a carpenter carrying the ordinary detached rule and pencil, or other marker.

NOTE.—Manufactured by Henry Disston, Philadelphia, who has recently obtained a

patent for another improvement in hand saws; which consists in imbedding in the handle, two spirit levels, one being parallel with, and the other at right angles to the back edge of the blade, so that the latter can be used either for leveling purposes or as a plumb rule.

Improved Mode of Preventing the Rapid Destruction of Gas Retorts. Patent granted to ALFRED MONNIER, Camden, New Jersey, February 26, 1857.

This invention consists in placing metallic retorts within a casing of baked fire-clay, between which and the metal, intervenes a space in which is packed any substance or combination of substances which will not, when heated, combine with either the iron or the clay. The invention has for its object the prevention of the rapid destruction of metallic retorts resulting from the ordinary mode of exposing them to the action of the fire. The packing in the intervening space has the advantage of allowing the metal and clay to expand and contract independently of each other, thereby avoiding the cracking of the clay, the certain result when the retorts are only covered with clay in the usual manner.

In carrying his invention into practice, the patentee places the metallic retort within a hollow cylinder of baked fire-clay, one end of which rests on the front, and the opposite end on the back wall of the furnace. A circular plate of fire-clay is then cemented into the back end of the clay cylinder in such a manner that it may be readily removed when necessary.

The space between the cylinder and the retort is about three-eighths of an inch; there is also a space of similar width at the rear end of the retort, and in these spaces is packed either asbestos, plumbago, baryta, alumina, magnesia, or any other substance which will not combine with, or in any way affect the integrity of, either the clay or metal when the latter are heated. The above substances, or their equivalents, may be used either alone, or two or more of them may be mixed together and packed into the space in the state of dry or slightly moistened powder.

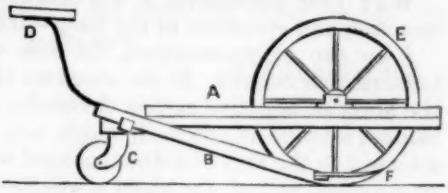
This mode of protecting retorts is especially applicable to such as are used for the manufacture of sodium.

Improvements in Mowing Machines. Patent granted to WM. CROOK, of New Hope, Bucks Co., Pennsylvania, April 13, 1858.

This invention relates to an improvement in that class of mowing machines in which the cutter frame is hinged to the main frame, and the improvement consists in securing the driver's seat to the cutter frame, and so far behind the centre of vibration of the latter that the weight of the driver may act as a counterbalance, or nearly so, to the cutting apparatus, and thus lessen its friction on the ground; that the driver may, by simply changing the centre of gravity of his body, raise the cutting apparatus from the ground, and allow it to fall again; and that the driver's hands may be at liberty for the proper management of his horses during the operation of the machine.

The annexed diagram will suffice to illustrate this invention.

A represents the main frame of the mowing machine; B the cutter frame jointed to the rear of the main frame; E the main driving-wheel; C a castor for supporting the rear of the main frame, and D the driver's seat.



This is situated at such a distance behind the point where the cutter frame is hinged to the main frame, that the driver may by leaning backwards or forwards raise the cutter frame, so that it may be free from any obstructions which may present themselves, and as easily allow it to fall by its own weight and without the aid of the usual mechanical appliances for effecting the same purpose.

MECHANICS, PHYSICS, AND CHEMISTRY.

Electric Lights.

To the Editors of the Mechanics' Magazine.

GENTLEMEN:—I wish to reply to a communication inserted in your Number for Dec. 26, 1857, signed "A Reader of long standing," relative to the electric light. If your correspondent referred to a lamp used some years ago by the Electric Power, Light, and Color Company, his remarks would have been correct. These, however, will no longer be applicable to the lamp at present possessed by the said Company, in which all the defects named by him are remedied.

The lamp to which I refer was invented and made by me: patented April 3, 1855; No. 739; and sold by me to the Company the same year.

With regard to his remarks on batteries, I agree with him that great improvements have yet to be made. Our knowledge of electricity is in its infancy, but, as we advance in information, it does not seem unreasonable to expect that we may succeed in the construction of batteries vastly superior to those at present known in power, economy, and portability.

Electric lamps may be classed under four heads.

First, those in which the separation of the electrodes is produced and regulated by clock-work, or other mechanism acting independently of the electric current.

Second, those in which the mechanism, although depending upon the electric current for its action, remains inoperative until that current ceases, from the resistance offered to its passage by the increased separation of the electrodes.

Third, those in which a carbon disk and pencil, or two carbon disk electrodes are used.

I agree with you, Messrs. Editors, as to the causes which have led to the failure of the above three lamps.

With your permission, I will endeavor to describe briefly the construction and operation of my lamp—the *fourth.*

I use two electro-magnets, the coils of which are traversed by the same electric current. To the armature of one of these magnets I attach the lower or negative carbon electrode; to the armature of the other magnet a brake is attached, which acts on the periphery of a wheel attached to the axis of a drum, around which a chain or cord is wound; to the other end of the chain a weight is hung, which carries off the upper or positive carbon electrode. When uninfluenced by the electric current, the brake does not press upon the wheel, and the weight descends by its own gravity, carrying the upper electrode with it, until it comes in contact with the lower one. But upon connexion being made with the battery, the following action takes place:—

Both magnets acting simultaneously, the armature which is attached to the lower electrode is drawn down UPON its magnet, whilst the brake is made to press upon the wheel by the armature attached to it being drawn TOWARDS the magnet which governs it; the upper electrode is thus prevented from descending, and the separation of the electrodes necessary for the production of the light is at once made. The brake armature is adjusted so that it shall remain at a considerable distance from the magnet; it is therefore sensible to any VARIATION which takes place in the force of the electric current.

Thus, when the distance between the electrodes increases from their gradual consumption, the resistance to the passage of the current becomes greater, and the power of the magnets is diminished. The brake is then liberated from the wheel, and the upper electrode descends until, by its APPROACH to the lower one, the resistance to the current is diminished, when the break is again drawn on to the wheel, and the further descent of the electrode is arrested. It is thus supplied exactly in proportion to its consumption. The consumption, in fact, is the governing power of the supply.

The average variation of the distance between the electrodes does not exceed $\frac{1}{800}$ of an inch.

The armature to which the lower electrode is attached is practically unaffected by the variations which take place in the force of the current, as it is almost in contact with its magnet, being only separated from it by a piece of card. Its office it merely to make the separation of the electrodes when the lamp is first put in action; but in case of accident, such as either of the electrodes being broken off so as to cause a total cessation of the current, the armature of the lower electrode would rise, whilst the upper electrode would descend until it came in contact with the lower one, when the same action would take place as at the starting, and the light would be immediately re-established.

This lamp requires no re-adjustment so long as the same battery power is used. Its construction is perfectly simple, therefore not liable to derangement. It requires no attention after being put in action.

When furnished with a sufficient battery and good electrodes, it has

never yet failed to give a constant and steady light. I have proved this many times, both publicly and privately; and it has frequently been burning for seven or eight hours consecutively, and would burn for any given time in proportion to the length of electrodes and condition of the battery. I am, &c.,

HENRY CHAPMAN.

London, Jan. 4, 1858.

For the Journal of the Franklin Institute.

Particulars of the Steamer Orizaba, No. 2.

Hull built by I. Simonson. Machinery by the Allaire Works, New York. Intended service, Gulf of Mexico.

HULL.—

Length on deck from fore part of stem to after part of stern post, above spar deck,		210 feet.	
Breadth of beam at midship section, above the main wales,		30 "	
Depth of hold,		10 "	6 inches.
Draft of water, at load line,		6 "	
" " below pressure and revolutions,		6 "	
Area of immersed section at this draft,	150 sq. ft.		
Tonnage,	630.		
Masts and rig—schooner.			

ENGINE.—Vertical Beam.

Diameter of cylinder,			44 inches.
Length of stroke,		10 feet.	
Maximum pressure of steam in pounds,	35.		
Maximum revolutions per minute,	23.		

BOILER—One—Return flued.

Length of boiler,		32 feet.	
Breadth "		12 "	
Height " exclusive of steam chimney,		9 "	
Weight of " without water,	51,000 lbs.		
Number of furnaces,	3.		
Length of grate bars,		7 "	
Number of flues,	15.		
Internal diameter of flues,	5,		17 inches.
	5,		13 "
	2,		20 "
Length of upper flues,		19 "	5 "
Diameter of smoke pipe,		4 "	
Height " "		40 "	

PADDLE WHEELS.—

Diameter,		26 feet.	
Length of blades,		6 "	
Depth "			18 inches.
Number "	24.		

Remarks.—Frames, 15 by 5½ inches; distant apart at centres, 24 inches. Hull strapped with diagonal and double-laid iron braces, 4 by ⅝-inch. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Bremen.

Hull and machinery built by Caird & Co., Greenwich. Owners, North German Lloyds'.

HULL.—

Length on deck,	328 feet.	
Breadth of beam (molded),	40 "	2 inches.
Depth of hold,	26 "	
" " to spar deck,	33 "	7 "
Tonnage,	2500.	
Masts—three—rig, barque.		

ENGINE.—Vertical Trunk.

Diameter of cylinders,		90 inches.
Length of stroke,	3 feet	6 "
Maximum pressure of steam in pounds,	25.	
Maximum revolutions per minute,	50.	

BOILERS.—Four—Return tubular.

PROPELLER.—

Diameter of screw,	17 feet.	
Pitch' "	30 and 33 "	
Number of blades,	3.	

Remarks.—Sketch of shape ┗, depth, 6 ins.; width of web, $\frac{11}{16}$-in.; width of flanches, $3\frac{1}{2}$ ins.; thickness of plates, $\frac{5}{16}$ to $\frac{3}{8}$-inch. Nine bulkheads. Iron plate water-ways on each deck, 30 ins.$\times\frac{1}{2}$-inch, and 36 ins.$\times\frac{3}{8}$-inch. Also, tie beams, 12 ins.$\times\frac{1}{2}$-inch, on each side of hatch combings. Also, frame ties, $2\frac{1}{2}\times\frac{3}{4}$-inch. 12 ins. apart from floor to main deck. C. H. H.

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*On the Manufacture of Puddled or Wrought Steel, with an account of some of the Uses to which it has been applied.** By WILLIAM CLAY, of the Mersey Steel and Iron Works, Liverpool.

In the paper which I am now about to submit to your notice, I have endeavored to treat of this comparatively new process, viz: the manufacture of puddled or wrought steel, with an account of some of the uses to which it has been applied, only in a mechanical and practical point of view, and to avoid entirely any questions as to the chemical change which takes place in the conversion of the crude cast iron into steel; and I have also endeavored to avoid instituting any comparisons between this process and any others which seek the same result, viz: the manufacture of cheap steel.

It will be well known to many interested in the manufacture of metals, and more especially to any who may have lately had occasion to visit the continent of Europe, that the manufacture of puddled steel has now been practised there for many years, and that the make is rapidly increasing, but as yet, the uses to which this material has been put are very limited when compared with the vast advantages which would be derived from adopting so strong and durable a material, when produced at a moderate cost.

* From the Journ. Society of Arts, No. 270.

The process I am about to describe, was patented in the year 1850, by Mr. Ewald Riepe, and it may be asked how it comes to pass that so valuable a patent has been allowed to remain almost entirely unknown in this country, when it was granted so long ago as 1850. One reason is the bad state of health of the patentee, who has seldom been able to devote more than a few days, at any one time, to the subject in this country, without becoming so ill as to be incapacitated from attending to business again for a considerable time. Another reason (as I am informed) is that the patentee, about the date of the patent, came over here and entered into working arrangements with one of the most important firms in this country, viz: the Lowmoor Iron Company, who have, up to this time, made about 1000 tons of the puddled steel, but who have not, I believe, carried the manufacture of it beyond the puddling process, but have sold the puddled bars to various Sheffield houses for them to carry into the further stages of manufacture, and more especially to Messrs. Naylor, Vickers & Co., of that town, who have used this material very largely for the manufacture of their cast steel bells, which, I may mention by the way, are also the subject of another patent by the same inventor.

In describing the process of making the puddled steel, I cannot do better than read an extract from the specification of the patentee:—

RIEPE'S PATENT.—"These improvements consist—Firstly, In a peculiar method of working in the puddling furnace. Secondly, In converting pig iron, or alloys of pig iron and wrought iron, into steel, with the co-operation of clay in the furnace. Thirdly, in or by the co-operation of atmospheric air.

"Firstly. I employ the puddling furnace in the same way as for making wrought iron. I introduce a charge of about 280 lbs. of pig iron, and raise the temperature to redness. As soon as the metal begins to fuse and trickle down in a fluid state, the damper is to be partially closed in order to temper the heat. From 12 to 16 shovelfuls of iron cinder discharged from the rolls or squeezing machine are added, and the whole is to be uniformly melted down. The mass is then to be puddled with the addition of a little black oxide of manganese, common salt, and dry clay, previously ground together. After this mixture has acted for some minutes, the damper is to be fully opened, when about forty pounds of pig iron are to be put into the furnace, near the fire bridge, upon elevated beds of cinder prepared for that purpose. When this pig iron begins to trickle down, and the mass on the bottom of the furnace begins to boil and throw out from the surface the well known blue jets of flame, the said pig iron is raked into the boiling mass, and the whole is then well mixed together. The mass soon begins to swell up, and the small grains begin to form in it and break through the melted cinder on the surface. As soon as these grains appear, the damper is to be three-quarters shut, and the process closely inspected while the mass is being puddled to and fro beneath the covering layer of cinder. During the whole of this process the heat should not be raised above cherry redness, or the welding heat of shear steel. The blue jets of flame gradually disappear, while the formation of grains

continues, which grains very soon begin to fuse together, so that the mass becomes waxy, and has the above-mentioned cherry redness. If these precautions are not observed, the mass would pass more or less into iron, and no uniform steel product could be obtained. As soon as the mass is finished so far, the fire is stirred to keep the necessary heat for the succeeding operation—the damper is to be entirely shut, and part of the mass is collected into a ball, the remainder always being kept covered with cinder slack. This ball is brought under the hammer and then worked into bars. The same process is continued until the whole is worked into bars. When I use pig iron made from sparry iron ore, or mixtures of it with other pig iron, I add only about 20 lbs. of the former pig iron at the later period of the process, instead of about 40 lbs. When I employ Welsh or pig iron of that description, I throw 10 lbs. of best plastic clay, in a dry granulated state, before the beginning of the process, on the bottom of the furnace. I add at the later period of the process, about 40 lbs. of pig iron, as before described, but strew over it clay in the same proportion as just mentioned.

"I do not claim the commencement of the above described process for making steel in the puddling furnace. But what I claim is the regulating the heat in the finishing process, and excluding the atmospheric air from the mass in the manner as described, and also the use or addition of iron to the mass towards the later part of the process."

The remainder of the specification it is not necessary to allude to.

The balls, instead of being rolled into bars, may be hammered into slabs or blooms, for such use as forgings, rails, plates, or any hammered or rolled steel which requires to be perfectly solid; but for ordinary use, puddled bars are made, at the Mersey Iron Works, from 2 to 14 ins. wide, which are afterwards cut up and piled for various purposes.

In using the puddled bar steel, it has been found very desirable to test each bar before using it, and to closely inspect the quality, and to select such as is best adapted to the purposes required, for instance, for steel rails, or railway points, or switches, which I roll at one operation direct to the regular taper-form desired, under a patent which I have "for rolling iron or other metals of taper form." I select the most crystalline steel for the upper and under surface of the rail or switch, and for the interior that which is of a more fibrous and tougher description. Between the centre and top and bottom of the rail, I place steel of an intermediate grade, which causes the whole pile or mass to weld up easily and work solid.

It is necessary in this, as in any operation in which steel is used, to take the greatest possible care in the heating and working of the material; but from the first commencement there has been found no difficulty in heating, rolling, or forging this steel into any form or shape, as it has been made into steel plates, bars, angle steel, rivet steel, rails, railway points, and forgings of all kinds with perfect ease and with success, and ever since the manufacture was commenced at the Mersey Steel and Iron Works, this steel has been used for almost everything that was required to be of a strong and durable nature, or to repair any of those breakages which are of such constant occurrence in every iron work.

It is somewhat worthy of remark that, although this process is so novel, and, apparently, of so delicate a nature, yet, with the specification as my only guide, having never before heard of or seen the operation, it succeeded perfectly in the first trial which was made, and produced so excellent a steel that, after working about 100 tons, it has hardly been surpassed. I have used pig iron of all descriptions, North Welsh, South Welsh, Staffordshire, and Scotch, with the same result, viz: the production of an excellent steel; but I have not found, so far, anything like the great difference that I expected between hot and cold blast iron. Most excellent results have been obtained from both; this is more particularly important as it shows that the extent to which this manufacture may be carried need not be circumscribed by the very limited supply of cold blast pig iron.

Having thus described the process of manufacture, it will be necessary to show a few of the qualities of the material produced.

The puddled steel bar when broken shows a clear crystalline and even fracture, and has the usual sonorous musical tone when struck. The crystals appear much finer and more regular than in ordinary blister steel, in fact, to the unpractised eye, the appearance is quite like that of the best cast steel, and it has all these distinguishing features by which steel is known from iron. It hardens to any degree that may be requisite, taking all the colors which develop themselves under the different degrees of heat, and may be made into such articles as ordinary chisels direct from the puddled bar; it will take a very fine polish, and has the same amount of elasticity that steel usually possesses.

In fact, I believe it to be useful in the Arts for all purposes for which steel is required, except, perhaps, for the finer descriptions of tools and cutlery.

One extraordinary feature in regard to this wrought steel is, that it can be produced either of a harsh, hard, unyielding character, or of a soft, silky, fibrous structure, or of any of the grades between these two points, and that a bar when quite cold may be bent up double and perfectly close (with extreme difficulty certainly on account of the great stiffness of the material) without the slightest sign of fracture, but, when forced back again, a beautiful long silky fibre is apparent: or if a piece of steel plate be partly cut through with a chisel and then broken, it appears beautifully fibrous; if made into a tool, for instance, and hardened, it at once assumes the crystalline character peculiar to steel.

In a series of experiments with regard to the improvements and deterioration which result from oft-repeated heating and laminating of bar iron, (undertaken when writing a paper on "The Forging of Wrought Iron in Large Masses," for a work entitled "The Useful Metals and their Alloys," and detailed at page 318 of that work), I found "that taking a quantity of ordinary fibrous puddled iron, and reserving samples marked No. 1, we piled a portion five high, heated and rolled the remainder into bars marked No. 2; again reserving two samples from the centres of these bars, the remainder were piled as

before, and so continued until a portion of the iron had undergone twelve workings.

"The following Table A shows the tensile strain which each number bore:—

No.		lbs.
1.	Puddled bar,	43,904
2.	Re-heated,	52,864
3.	"	59,585
4.	"	59,585
5.	"	57,344
6.	"	61,824
7.	"	59,585
8.	"	57,344
9.	"	57,344
10.	"	54,104
11.	"	51,968
12.	"	43,904

"It will thus be seen that the quality of the iron increased up to No. 6 (the slight difference of No. 5 may perhaps be attributed to the sample being slightly defective), and that from No. 6 the descent was in a similar ratio to the previous increase."

In a somewhat similar series of experiments undertaken with this steel, it appears that, after the first piling, when the bars become solid, a deterioration in respect to tensile strength takes place, which is slow and gradual, but in a regularly increasing degree, as will be found by the following Table B:—

No 1.	Puddled steel bar bore		96,911 lbs.	per	square inch.
2.	Piled	"	121,408	"	"
3.	"	"	111,608	"	"
4.	"	"	121,408	"	"
5.	"	"	111,608	"	"
6.	"	"	111,608	"	"
7.	"	"	91,136	"	"
8.	"	"	91,136	"	"
9.	"	"	91,136	"	"
10.	"	"	91,136	"	"

Mem.—The weight increased 20 cwt. at a time.

The steel used for these trials was what chanced to be at hand, and was not particularly remarkable for any extraordinary degree of strength. The appearance of the fracture of the sample bars, when broken by the hammer in the usual manner, presents to the eye a very slight difference, the color and size of the crystals being, to all appearance, much the same in No. 2 as in No. 10; but when torn asunder by a machine for the purpose, a very marked difference is observable, the higher numbers having a very fibrous silky fracture; and yet the characteristics of steel are perfectly preserved, for No. 10 hardens, takes the usual colors, in fact, possesses all the distinguishing properties of steel.

I would wish especially to call attention to this steel as a material for large forgings and for ordnance purposes.

It is generally understood in this country that cast steel has been, to a certain extent, a failure for such uses, and that it has been found that, unless a considerable amount of hammering and rolling be ap-

plied to the cast steel material subsequently to the founding process, the strength of such cast steel material is very inferior to that where it has been consolidated by the action of the hammer or the rolls, and that it is not at all suitable where sudden strains are inevitable.

Mallet, in his valuable work on "The Construction of Artillery," argues that cast steel is not suited for ordnance on account of its deficiency in point of elasticity when compared with wrought iron or gun metal.

I imagine that this want of elasticity may be partially accounted for in this manner, viz:—Cast steel requires a very high temperature to render it fluid for founding, which necessarily causes a considerable amount of shrinking in the casting when passing from the fluid to the solid state, and the casting is of that peculiar crystalline structure which is produced under such conditions (weakened to a great extent also by the strain caused by shrinkage), unless the steel casting is afterwards subjected to the hammering or rolling process before mentioned, by which the particles of steel are relieved from their shrinking strain, and are consolidated and allowed to assume a comparative state of repose.

In the manufacture of forgings from puddled steel, the case is very different. We possess, in the best puddled steel, as great, if not a greater amount of strength, as in cast steel under the most favorable circumstances, and as the particles of wrought or puddled steel are never in a state of fusion from the time of their first formation in the puddling furnace, the enormous contractile strain incident upon the transition of the steel from the fluid to the solid state, is avoided in the first place, and also the grain of the puddled steel may be so placed in the forging to be made, as the strain which it will be called upon to resist may require, and the different descriptions of steel, whether crystalline or fibrous, may be arranged in the best positions as regards strength and durability. Take, for instance, a large gun forging; the interior may be made of hard crystalline steel, to resist the enormous wear and tear, and the exterior of a softer and more fibrous description, as above described, a result evidently impossible with cast steel, which must necessarily be homogeneous, and be either entirely hard or entirely soft.

It would not surprise me if, with more experience of this new manufacture, it should be found that wrought steel bears the same relative position with regard to cast steel that wrought iron does to cast iron.

There has of late been a considerable controversy respecting an alleged deterioration of wrought iron, when being made into large forgings, from a supposed crystallization of the material employed. I have always endeavored to maintain, and in my work already referred to, I have attempted to show, that where this crystallization took place it was purely the result of carelessness or incompetence.

With wrought steel, the danger from this cause is very materially lessened, indeed, rendered almost impossible, for the heat at which it welds is much less than that required to weld iron, as also if the steel be heated too much (and long before any deterioration from crystalli-

zation could set in) the forging when brought to the hammer would be so tender that it would fall in pieces, and would in that manner be wasted for the purpose required; there is, therefore, little fear that crystallization, otherwise bad workmanship, can materially injure this tell-tale production.

Steel forgings have been made, at the Mersey Steel and Iron Works into piston rods, (some with the piston forged solid, 18 inches diameter, for a Nasmyth hammer), large roll screws, shear pins of all sorts, rolls for rolling iron, hammers and anvils, and for a variety of other purposes. In making these forgings no difficulty was experienced; rather more time was required on account of the necessity of heating the steel slowly, and also because the hammer did not make the same impression on it that it does upon iron.

The effect of forging upon this steel is to consolidate it, and when broken in the usual manner, the appearance of the crystals is much finer than when it is rolled, as might be expected.

Of all the various uses to which this steel may be applied, there are perhaps none so important as its application to marine and railway purposes; for the former use, the material offers directly so considerable saving in regard to weight, with an equal amount of strength (putting out of the question its durability and other advantages) that its universal adoption can hardly be doubted. A commencement has been made by the Board of Admiralty, who have used considerable quantities of Howell's homogeneous metal in the manufacture of marine steam boilers, as stated in the *Times* newspaper of July 6th, which says: "In consequence of the successful trials which have been made at Woolwich, of Messrs. Shortwell, Howell, and Jessup's homogeneous metal, government have given directions for the use of that metal in the construction of steam boilers, one of which is ordered to be made for the 17 gun steam sloop *Malacca*, Capt. Arthur Farquhar."

For railway purposes it is nothing new to propose steel for rails, points, and crossings, &c., as the attention of engineers has long been directed to it, both in this country and abroad, but the difficulty has hitherto been the cost of steel for such purposes. Some attempts have been made to harden the face of rails, and to steel the working parts of tyres, but, I believe, the result has not been altogether satisfactory, and the cost considerable; but with wrought steel, the tyres, points, or rails, may be made altogether of hard crystalline steel, or an outer surface of hard and an inner portion of fibrous steel, as required, and at a cost very materially less than that at which steel has hitherto been produced.

With regard to the ultimate resistance to tension of steel as compared with iron, we find by the tables recently published in the reports of experiments on the strength and other properties of metal for cannon made by officers of the United States Ordnance Department, that the strength of various descriptions of English, American, and Russian wrought iron, tested by them, varied from 53,903 lbs. to 62,644 lbs. per square inch.

The ultimate cohesion of tilted cast steel bars, as published in Table

No. 9 of Mallet's work on the construction of artillery, is stated at 142,222 as the highest, with 88,657 as the mean per square inch.

Other estimates of the ultimate cohesion of steel give,

Tempered cast steel, at . .	150,000 lbs.
Cast steel, ...	134,256 "
Shear steel, ...	124,400 "
Blister steel, . . .	133,152 "

With wrought steel I have also found considerable variation in regard to tensile strength, more particularly when experimenting, as it is necessary constantly to do in a new manufacture, with various descriptions of pig iron and different charges. But when working regularly I have found no more difficulty in obtaining an uniform result than in the manufacture of iron, and with more experience we may safely expect some improvement even in this particular.

The first bar that was tested broke at 173,817 lbs. per square inch. This extraordinary endurance I have not since equalled, the nearest approach to it being 160,832 lbs. per square inch.

The average tensile strength of the steel, however, may be estimated at about 50 tons per square inch, or 112,000 lbs.

Of four samples tested at the Liverpool Corporation chain-proving machine, on the 8th of January, 1858, the first bar, which was made as hard as fire and water could render it, broke at something less than 112,000 lbs., but the exact weight was not ascertained. (This trial bar was from the same steel as No. 3, which, as will be seen, bore the heaviest test in its natural state.) Test bar No. 2 broke at 112,000 lbs., or 50 tons per square inch. No. 3 broke at 125,440 lbs., or 56 tons per square inch. No. 4 broke at 98,560 lbs., or 44 tons per square inch.

MEM.—This last sample had a slight flaw, which probably caused the difference.

TABLE C.—*Tensile strength of Iron and Steel Bars per square inch.*

Descriptions of Iron and Steel.	Tensile strength.	Authority.
Russian Iron, . .	62,644	American Board of Ordnance.
English Rolled Iron, .	56,532	
Lowmoor " .	56,103	
American hammered, .	53,913	
Krupp's Cast Steel, average of 3 samples, . .	111,707	Minister of War, Berlin.
Cast Steel, highest, .	142,222	Mallet.
" mean, . .	88,657	do.
" " .	134,256	
" tempered, .	150,000	
Shear Steel, . .	124,400	
Blister " . .	133,152	
Mersey steel and Iron Co. Puddled Steel, highest, .	173,817	
Ditto, another sample, .	160,832	
Average of three samples tested at the Liverpool Corporation testing machine, .	112,000	

This steel will also be found most useful for chains and ships' cables, and although the few samples which I have had made all broke at the weld, evidently from want of experience on the part of the smith in working this new material, yet the strains borne at the Liverpool Corporation chain testing machine, even with imperfect welds, are tolerably satisfactory, as will be seen by the following:—

	Tons.	Govt. proof strain. Tons.	Cwt.
Chain 9-16 inch, close link, broke at,	12	3	15
Chain 9-16 inch, stud link, broke at,	13	5	10

TABLE D.—*Tests of Steel, &c.—Bars 2 inches square, 3 feet between supports, weight in the middle.*

	HAMMERED PUDDLED STEEL BAR.				HAMMERED IRON BAR.			
Weight on Centre.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.
T. C.								
3 18	·18	Nil	Nil	Nil	·28	Nil	·14	Nil
4 18	·37	·18	·14		1·03	·74	·79	·65
5 18	·75	·37	·51	·37	1·45	·42	1·21	·42
6 18	1·12	·37	·79	·28	2·03	·57	2·25	·90
7 18	1·68	·56	1·31	·51	3·84	1·81	3·60	1·35
8 18	2·15	·64	1·78	·46	4·93	1·09	4·96	1·51
9 18	2 62	·46	2·25	·46				
10 18	3 46	·84	3·09	·84				
11 18	4 12	·65	3·75	·65				
12 18	4 68	·56	4·31	·56				

	ROLLED PUDDLED STEEL BAR.				ROLLED IRON BAR.			
Weight on Centre.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.	Total Deflection.	Additional Deflection.	Permanent Total Set.	Additional Permanent Set.
T. C.								
3 18	·56	Nil	·37	Nil	·84	Nil	·65	Nil
4 18	1·12	·56	·84	·46	1·21	·93	·93	·28
5 18	1·78	·65	1·50	·65	2·15	·37	1·87	·93
6 18	2 57	·79	2·25	·75	3·56	1·40	3·28	1·40
7 18	3·37	·79	3·00	·75	5·06	1·50	4·68	1·40
8 18					6·75	1·68	6·37	1·75
9 18								
10 18								
11 18								
12 18								

Table D gives the deflection of hammered and rolled bars of steel and iron with increasing weights.

The samples, as I have since discovered, were of too soft a descrip-

tion, and better results would have been obtained with harder steel, or perhaps the best results might be obtained by a mixture of hard and soft steel, the hard being placed above the neutral axis, the part which is deflected by compression, and the soft, which is deflected by extension, below.

In experimenting upon the strength of this steel, I found the weight requisite to punch steel and iron plates was relatively as follows. The plates were all $\frac{1}{4}$-inch thick, and the size of the punch $\frac{1}{2}$-inch (circular).

	Tons.	Cwt.
Ordinary boiler plates, punched with a pressure of	8	18
Charcoal,	8	3
Steel,	15	10

In several trials of the tensile strength of steel plates, it was found that the strain required to break a square inch of this steel, varied from 44 to 55 tons.

It may perhaps be well to mention also, that there is no difficulty in working this steel, either hot or cold, in any manner in which the best descriptions of iron are worked, and that no particular knowledge or skill is required on the part of the workmen who use it.

These results show the importance of steel as a material for boilers and shipbuilding purposes, as also for girders and bridges, as the economy in the weight of material required is of the greatest importance for these and for many other similar purposes.

In conclusion, I beg to apologise for the very imperfect paper that I have had the honor of laying before you, but I would plead in excuse the very limited time that has elapsed since I first commenced the manufacture of this material, and also that, from the extraordinary and novel nature of this steel, I have been often much perplexed and puzzled, and have had to renew experiments again and again before I could fully comprehend the sometimes apparently contradictory facts which presented themselves, and added to this that it was in the first place necessary to unlearn a good deal of what I had always been accustomed to look up to as the foundation of all knowledge of the iron and steel manufacture, a task much more difficult than the acquisition of any new idea, when the mind is not occupied with preconceived notions and old established prejudices.

In the experiments which I have tried, I have taken every care to be as accurate as possible, and as the trials have gone on, I have had more and more cause to feel confidence in the result obtained, and, had time permitted, I should have been glad to have extended the trials, as the more I investigated the nature of this material the more satisfactory I found it.

I do not for a moment anticipate that steel manufactured by this patent process will supplant the best description of steel, but I feel confident that it must come largely into use for most ordinary purposes, where cast steel, from its great cost, cannot be used.

Indeed, if I might indulge somewhat in prophecy, I would express my belief that, in a few years, the manufacture of this wrought steel

will have become as important a branch of our national industry as that of iron now is.

If the few facts which I have, however imperfectly, placed before this Society, lead to further inquiry by others more competent, and having more leisure to conduct them to a successful issue, I shall be amply repaid for the time and pains that I have bestowed upon the subject.

For the Journal of the Franklin Institute.

Final Success of the Voyageur De Le Mer.

This steam yacht sailed from India wharf, Boston, at 10½ A. M., on the 30th of June, and returned at 4 P. M. the next day. She went down the harbor under steam alone, then was worked under steam and sail together till sunset, when the propeller was disconnected, and the vessel was worked under canvass alone till about 10 A. M. the next day, when the propeller was again coupled and the sails furled, and the vessel steamed back to her port against a fresh wind. The run from the light ship at Minot's Ledge to Boston Light, nine statute miles, was made in 55½ minutes, the tide being about slack water. This, considering the strong wind ahead, was the best part of her performance, but the steam was at no time allowed to follow the pistons more than about ¼ stroke, and was kept throttled to check the tendency to prime. The highest number of revolutions was 36. The boiler pressure employed was from 30 to 40 lbs., but the indicator showed the maximum pressure in the cylinders to have been only about 12 lbs. The speed made under sail alone was 10½ knots, and under both steam and sail, with a fresh wind, 13 knots.

The particulars of this splendid and quite novel vessel, published in vol. xxxv., p. 397, are correct, except the thickness of the bulkheads. They are of ¼ inch iron instead of ½ inch as there given.

The lines of this ship, by Mr. Samuel H. Pook, deserve especial admiration. The hull glides through the water with the same absence of commotion which formed so distinguishing a feature of the late Geo. Steer's constructions.

The principal alterations which have transformed this vessel into a very creditable one, are the addition of a small dome on each boiler, a stiffening of the engines, and an addition of an expansion gear invented by Mr. George A. Corliss, of Providence, for this especial case. This part of the apparatus is worthy of the highest admiration as a triumph of engineering and inventive skill over very extraordinary difficulties. The attention of the Corliss Engine Company had not been attracted to this ship until the latter part of March last, and a contract for the work was not signed until April, yet the vessel is now *en route* for the land of the Pharaohs, with a valve gear constructed some fifty miles from the ship, the first of its kind ever adapted to oscillating engines, and fitted perfectly to the old work, and to the very small amount of space remaining about the same, so that none of the old work had to be displaced or altered. The valves are shut quietly and very promptly

by powerful springs, and are released at any point from commencement up to half stroke, as in the ordinary Corliss engine, while the provision for easy reversing has rarely been equalled.

Although the boilers will probably continue to furnish rather wet steam, the vessel as completed, bids fair to reflect much credit on her constructor. T. D. S.

New York, July 23d, 1858.

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*On the large Blowing Engine and new Rolling Mill at Dowlais Iron Works.** By Mr. W. Menelaus.

The large blowing engine and rolling mill, forming the subjects of the present paper, are particularly remarkable for their great size (the blowing engine being the largest of its class hitherto erected either in this country or abroad), and were designed with a view to turning out a large quantity of work, with the greatest possible security from risk of failure, or deficiency of the blast, or of breakage of the machinery.

The engine was erected in 1851. The blowing cylinder is 144 inches diameter, with a stroke of 12 ft., making 20 double strokes per minute; the pressure of the blast being $3\frac{1}{4}$ lbs. per square inch. The discharge pipe is 5 feet diameter, and about 140 yards long, thus answering the purpose of a regulator. The area of the entrance air-valves is 56 sq. feet, and of the delivery air-valves 16 square feet. The quantity of air discharged at the above pressure, is about 44,000 cubic feet per minute. The steam cylinder is 55 inches diameter, and has a stroke of 13 feet, with a steam pressure of 60 lbs. per square inch, and working up to 650 horse power. The steam is cut off when the piston has made about one-third of its stroke, by means of a common gridiron valve, near the back of the slide-valve: there is also, on one side of the nozzle, a small separate valve, for moving the engine by hand when starting. The cylinder ports are 24 inches wide, by 5 inches long, and the slide-valve has a stroke of 11 inches, with $\frac{1}{2}$ inch lap. The engine is non-condensing, and the steam is discharged into a cylindrical heating tank, 7 feet diameter, and 36 feet long, containing the feed water from which the boilers are supplied. Under the steam cylinder there are about 75 tons of cast iron framing, and 10,000 cubic feet of limestone walling in large blocks, some of them weighing several tons each.

The beam is cast in two parts, of about $16\frac{1}{2}$ tons each, the total weight upon the beam gudgeons being 44 tons; it is 40 feet 1 in. long, from outside centre to outside centre, and is connected to the crank on the fly-wheel shaft, by an oaken connecting rod, strengthened by wrought iron straps. The beam is supported by a wall across the house, 7 feet thick, built of dressed limestone blocks, to which the bearings are fastened down by twelve screw bolts of 3 inches diameter. The fly-wheel is 22 feet diameter, and weighs about 35 tons.

Eight Cornish boilers are employed to supply the steam, each 42 ft. long, and 7 feet diameter, made of $\frac{9}{16}$ inch best Staffordshire plates, and

* From Newton's London Journal, April, 1858.

having from end to end a single 4-foot tube, in which is the fire-grate, 9 feet long.

For some time, this engine supplied blast to eight furnaces of large size, varying from 16 to 18 feet across the boshes; it is now blowing, with three other engines of small dimensions, twelve furnaces, some of which make upwards of 235 tons of good forge pig per week; the weekly make of the twelve furnaces being about 2000 tons of forge pig iron. With the exception of the cylinders, made and fitted at the Perran Foundry, Truro, the engine and boilers were made at the Dowlais Iron Works, and erected according to the design, and under the superintendence, of Mr. Samuel Truran, the Company's engineer.

The engines for driving the new rolling mill, now in course of erection at the same works, are a pair of high pressure engines coupled at right angles. The steam cylinder is 45 inches diameter, with a stroke of ten feet, making 24 double strokes per minute. Each cylinder has a common slide-valve of brass, worked by an eccentric on the main shaft. The expansion valves are of the gridiron sort, worked by a cam on the main shaft, the steam being cut off at about one-third of the stroke; an arrangement is made for throwing these valves out of gear when the engines are doing heavy work. Each engine is furnished with a small slide-valve, to be worked by hand, for the purpose of starting and reversing. The steam is supplied by six Cornish boilers, 44 feet long, and 7 feet diameter, having a 4-foot tube in each; the whole of the plates are best Staffordshire, $\frac{9}{16}$ inch thick, and the total weight is 120 tons. The framing under the engines and machinery is of cast iron, and consists of four lines, each 75 feet long, 12 feet high, and 21 ins. wide; the whole weighing about 850 tons.

Each beam is in two parts, the sides weighing about 17 tons, making the total weight of each beam, when complete, about 37 tons. The two beams are supported upon eight columns, 24 feet long, and $2\frac{1}{2}$ feet diameter, securely fastened at the bottom in deep jaws cast upon the framing. Upon the top of each group of four columns is a large and heavy entablature plate, which carries the plummer blocks under the main gudgeons. Each column passes through the entablature, the bosses at the junction being 24 inches deep; these are bored, and the tops of the columns turned, so as to ensure a perfect fit. The plummer blocks are secured by wrought iron keys in jaws cast on the entablature in the usual manner. The connecting rods are of oak, with wrought iron straps.

The driving-wheel shaft is of cast iron, with bearings 24 ins. diameter; the fly-wheel shaft is also of cast iron, with bearings 21 ins. diameter. The diameter of the driving-wheel is 25 feet to the pitch line; width on the face, 27 inches; and pitch, 7 inches. The diameter of the spur-wheel or pinion on the fly-wheel shaft is 6 feet, and the teeth are strengthened by a flanch running up to their points on each side. The fly-wheel on the mill shaft is 21 feet diameter, and weighs about 30 tons, making upwards of 100 revolutions per minute. The whole of the fastenings, both of the wheels and framing, are of dry oak and iron wedges.

These engines will drive one rail mill capable of turning out 1000 tons of rails per week, another mill capable of making 700 tons of rails or roughed-down per week, and one bar or roughing-down mill capable of making 200 tons per week: they will thus readily turn out 2000 tons of iron per week. Two blooming mills, with three high rolls and two hammers, will also be worked by the same engines. The saws and small machinery will be driven by separate engines, as will also the punching and straightening machines.

The roofs cover a space of 240 ft. by 210 ft., and are to be covered with corrugated black plates of No. 14 wire gauge thickness. The span is 50 feet; the roofs being supported upon lattice girders of an average length of 45 feet.

It has long been felt, that the power of rolling wrought iron of large section and great lengths has not kept pace with the requirements of engineers, who are hampered in their designs by the impossibility of obtaining iron of sufficient dimensions. For engineering works of any magnitude, bars of great length, considerable width, and moderate thickness, are frequently required. In the ordinary mode of rolling, the length and width of the bar are measured by the power of the engine and the time occupied in rolling. It is obvious, that to finish a bar quickly, it is necessary that it should be rolled in two directions, to prevent delay; and long and heavy bars can be thus rolled only by an engine of enormous power. This object is designed to be attained by the large combined engines now described. A simple arrangement of rolls for working in two directions, containing two pairs of rolls, is also employed. The lower pair of rolls is driven from the fly-wheel shaft, and under ordinary circumstances will be worked in the usual manner,—rolling the bars in one direction, and lifting them over the top roll in coming back. When it is necessary to make extra-sized bars, a second pair of rolls is put in the standards, and driven from the fly-wheel shaft by a pair of spur-wheels, thus giving the means of working the iron in both directions. By this arrangement the mill is expected to be able to roll iron of such sections and lengths as have been hitherto unattainable.

Proc. Insti. Mech. Engineers, London.

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*White Brass, or Unoxidizable Cast Iron.**

M. Porel, of Paris, has prepared an alloy which has the appearance and fracture of ordinary zinc, but it is as hard as copper or iron, and tougher than cast iron. It may be turned, filed, or drilled, as easily as those metals; does not adhere to metal moulds, and retains its metallic lustre perfectly in a moist atmosphere. This alloy is prepared by melting together zinc, copper, and cast iron. It contains 10 ℔ cent. copper and 10 ℔ cent. iron. This alloy may be used for various purposes in the construction of machinery; it may be made to appear like bronze, either by covering it with a deposit of metal, or by throwing up the copper superficially, and is, therefore, well adapted for casting vases, statues, and other objects of artistic character that are to be exposed to the atmosphere, especially as it is not a costly material.

* From the London Mining Journal, No. 1173.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, July 15, 1858.

John Agnew, Vice-President, in the chair.

John F. Frazer, Treasurer.
Isaac B. Garrigues, Recording Secretary. } Present.

The minutes of the last meeting were read and approved.

A Letter was read from "La Société Industrielle de Mulhouse," Mulhouse, France.

Donations to the Library were received from the Commissioners of Patents, London; Lieut. J. M. Gillis, U. S. Navy; James P. Espy, Esq., Washington, D. C.; Charles H. Haswell, Esq., New York; Major Robert Walker, St. Louis, Missouri; the Legislature of Pennsylvania, and from George W. Fahnestock, Esq., Professors John F. Frazer, and B. H. Rand, and the Pennsylvania Hospital, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of June.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (4) were proposed, and the candidates (4) proposed at the last meeting were duly elected.

Prof. John F. Frazer announced the decease of Abraham Miller, Esq., late Vice-President of the Institute.

On motion of Prof. Frazer, the Corresponding Secretary was instructed to transmit to the Commissioners of Patents, London, the special thanks of the Institute for their valuable donations of English Specifications of Patents, and the accompanying Indexes, &c.

Mr. John H. Cooper exhibited his improved oil cup, the body of which is of the usual form of oil cups for lubricating machinery; on the top is a hollow projection communicating with the interior of the cup. This hollow projection, which represents the frustrum of a cone inverted, is surmounted with a projecting ledge, which serves the purpose of preventing the dust from accumulating near a door way cut into the side of the projection.

A tightly fitting door, opening inwards, is adapted to the door way, and forms part of the conical surface when closed.

The peculiar manner in which the door is hung and weighted, keeps it closed until pressed from the outside by the nozzle of the oil can, when the cup needs replenishing with oil.

There is no opening to the interior of the cup except the aforesaid door way and the outlet for oil to that part of the machinery which is to be lubricated.

For locomotives, where the constant jar and motion would have a tendency to open a weighted door, Mr. C. proposes to use a very light door closed by a spring, which would effectually maintain the door in its closed position.

Oil cups with spring valves have been heretofore proposed and patented; the orifice for the admission of oil, however, has invariably been situated at the top of the cup, the very point where the dust is most likely to accumulate and accompany the flow of oil to the interior when the cup is replenished.

In these cups, too, the springs for closing the valves are situated in the body of the cup, and immersed in the oil, rendering them liable to rapid corrosion as well as inaction from accumulation of dust.

In Mr. C's. arrangement, the spring or weight for closing the door is in the hollow projection, and is always above the oil.

Mr. Howson exhibited an improved head for surveyors' tripods, for which a patent was granted Mr. W. J. Young, of this city, on the 10th of July last.

The invention consists in constructing the plate to which the theodolite and plumb line are attached so as to be adjustable in any direction horizontally to the cap of the tripod, the ordinary leveling screws serving the purpose of securing the plate after adjustment.

The object of the invention is to facilitate the adjustment of the plumb line to any given point on the ground, without the operator having to resort to the usual tedious process of adjusting the legs of the tripod.

Mr. Young's very simple but ingenious improvement, serves the desired purpose admirably, and this, without adding any complication of parts or extra expense.

Dr. Gumpert laid on the table specimens of photo-lithography, made by Mr. Rehn, (under Cuttings' patent;) these were microscopic objects magnified from 100 to 500 diameters, showing the structure with great clearness and beauty. This new process offers a correct, cheap, and beautiful mode of illustrating works of nature or art, as it appears illimitable in its application. Machinery, architectural designs, anatomical objects, and whatever the "camera" is capable of depositing on the prepared stone, may, without artistic aid, be printed from, as in ordinary lithographic work.

A machine designed to register the number of bushels of grain passed over it, was exhibited by the inventor, Mr. Atkins. It consists of a platform hinged at one end, and sustained by a spring at the other end. The spring is just sufficient to hold up the platform, and yields, when the measure of grain is placed upon it as it passes from the measurer. A pawl near the hinged end, moves with the platform, and when depressed, falls into a tooth of a ratchet wheel, which it turns when rising by the action of the spring, actuating a train of wheels and pointers moving around dial plates; and also, striking a bell to give notice that each one is registered. One dial registers units, the other fifties or hundreds. A bell of different tone is struck when each fifty or one hundred is counted. The wheels and dial plates are enclosed in a box, two glazed apertures permitting the position of the pointers to be seen.

BOARD OF MANAGERS.

Abstract from the Proceedings of a Special Meeting, held at the Hall of the Institute, July 15th, 1858.

On motion of Prof. John F. Frazer, it was

Resolved, That the Board of Managers of the Franklin Institute, have heard with great regret of the death of their late Vice-President, Mr. ABRAHAM MILLER, who has been associated with this Board from its earliest organization, and was endeared to his fellow members by his kindly manners and his liberal public spirit.

Resolved, That as a mark of respect to his memory, the Board will attend the funeral in a body.

Resolved, That these resolutions be communicated to the family of the deceased.

BIBLIOGRAPHICAL NOTICE.

Geological Surveys in Kentucky during the years 1856 *and* 1857. By DAVID DALE OWEN, Principal Geologist.

Two years ago, a handsome volume appeared at Frankford and Lexington, giving the results of the geological survey of Kentucky, during the years 1854 and 1855, under the superintendence of Dr. David Dale Owen, assisted by Dr. Robert Peter as chemist, and Mr. Sidney S. Lyon as topographer. We have lately received a second and third volume, with plates of fossils and maps of several of the most important counties of the state, excellently done, carrying forward the description of the survey to the close of the last season, that of 1857. It is evident from an inspection of the volumes that this survey is destined to exercise an important influence upon the future knowledge of American geology, and Dr. Owen deserves the thanks of geologists for publishing so rapidly and fully his results. The important error of duplicating the vertical section of the western coal measures made in the first volume is corrected in the second, and a very complete *coup d'œil* of the state permitted to the reader by the short descriptions of the geology of the counties in their order on the map.

The marked feature of this State Geological Report is the great number of its metallic assays and analyses of coals, limestones, soils and clays, occupying in fact 570 of the 1360 pages of the three volumes, and numbering as high as 775 analyses in all; a body of materials under this head of science, if accurately manipulated, of rare value not only to the economical estimates to be put upon the localities in Kentucky, but to the general chemistry and geology of the globe. The diligence of Dr. Peter is exemplary, as proved by the fact that the average annual number of analyses for the four years of the survey has been nearly two hundred. Those of the mineral waters of the state are of curious interest, especially those of the waters of magnesian springs (vol. i, p. 102; vol. iii, p. 54, &c.) causing the celebrated milk sickness of the west. Those of the soils, subsoils and various

clays are a still more important addition to our stock of agricultural knowledge.

The reports of Mr. Lyon are confined chiefly to the stratography of the two coal regions of the State, where it was undoubtedly of urgent use to commence the survey and do the most finished work. Topography is essential to the right geography and geology of all coal regions; and, even apart from the necessity of a new State map, the old map being at every point unreliable, it was important to map the counties which contain coal. A base line was therefore commenced at Uniontown, on the Ohio River, (latitude 37° 46′ 4″ approximately,) and carried due east through the centre of Third Street, Owensboro' (233,300 feet,) Knottsville (296,318 feet,) and as far as to William Smith's farm in Hancock County (322,975 feet,) where we understand it has been taken up this spring and carried forward toward the eastern coal field south of Maysville, the western outcrop of which it is expected to cross this month. With this base line, when finished, the detailed surveys of Hancock and Hopkins Counties in the west and of Greenup and Carter Counties on the east, already completed, will be tied, and in the subsequent years all the other counties of the state of which detailed surveys may be ordered. This policy of Dr. Owen inaugurates a new era we hope in American geology, setting an example which every state will in turn follow. Base lines in all the states may be run at slight expense and find fixed termini in one or other of the primary triangle stations of the Atlantic, Lake or Gulf Coast surveys. Now that Colonel Graham of the U. S. A. and Lieutenant Ashe of the B. A. have made their important determination of the latitude and longitude of Chicago by telegraphic signals between Chicago and Quebec, the old perplexing error of the lake survey will disappear and the still more extraordinary error of nearly a half a degree of longitude ranging along the western lines of Virginia, North and South Carolina can be reduced. It seems incredible that at this late day, no map of the United States can be constructed on which the States of the Atlantic seaboard and the States of the valley of the Ohio and Tennessee can be made to join. Yet such is the simple fact, and we hope to see the Legislature of Virginia take up Dr. Owen's base line as soon as it strikes the Sandy and carry it forward to the Chesapeake. It will pass through the towns of Covington, Lexington, Lovingston in the middle of the State, leave the University fifteen miles to the north and the Capitol as many to the south, cross the Chesapeake near Urbana and pass through Drummondtown into the Atlantic.

In connexion with the topography of the survey, we notice a theory of structure described by Mr. Lyon which we confess to reading with some surprise, and from which we must dissent until confirmed by further observation of an instrumental kind. Mr. Lyon describes the Greenup County region of the coal measures as a region of anticlinal waves, not ranging parallel with the central axis of the great coal field, like the faults and waves of Virginia and Pennsylvania, but occupying the subordinate positions of the axis lines of the ridges between the streams. If we understand his language, he makes this phenomenon

universal for Greenup County. But a glance at Mr. Mylotte's beautiful contour map of that county, shows these ridges to be numerous, unsymmetrical, and running off in various directions, which makes their anticlinal structure almost an impossibility, to say nothing of the well established fact that through all other regions of the coal measures as yet carefully studied, the very reverse holds true, the interstitial ridges being synclinal, exemplifying one of the most beautiful and stable laws of topography.

There is another point also which needs remark, not in a spirit of cavil nor even of confidence, for this at least involves an open question. But Mr. Lyon says, on page 308, vol. ii,—"along the entire line from Tygert's Creek there is manifestly a thinning of the sub-carboniferous limestone, millstone grit and other coal measures, *evidently marking the margin of the coal basin toward the north-west.* It is highly probable that many of the beds found in considerable force east of Little Sandy River will be found, on examination, to have entirely thinned out even before they reached that river, *other beds lying three or four hundred feet higher in* the series east of Little Sandy, *may* on White Oak Creek *be found resting on the millstone grit* which has thinned out to twelve feet and here rests on the knobstone; the sub-carboniferous limestone having entirely disappeared. It is highly probable that the line of the margin of the basin was frequently changed from the time of the deposition of the limestone to the end of the coal period. The coal basin being shallower near the margin, &c." The italics are our own, and show the point of discussion. We are startled by so bold a conjecture, that coal beds so high in the series, and persistent over such an enormous area as from Northern Pennsylvania to Western Kentucky, should in a few miles and in the very centre of this area fall down to and lie flat upon the conglomerate base of the coal measures. Lesquereux distinctly proves that coal 3 of Western Kentucky, is the equivalent of coal D of Western Pennsylvania, and that coal 4 of Western Kentucky, (coal E of Western Pennsylvania,) is the Pomeroy coal and also the Salem bed in the anthracite region and always maintains its position. Mr. Lyon's view we know is a common one; the geologists of Ohio have spoken years ago in very nearly the same terms of the Mahoning Valley coal measures. But we are convinced that this language says more than it means to say and instills a very important error into the minds of those who have not been taught by long topographical experience to distinguish always and involuntarily between the edge of a present coal area and the shore of the original coal depositing sea. These *may* in some few instances be coincident, as they certainly are in some of the ravine deposits of cannel coal beyond the Mississippi, and perhaps are so in some of the small basins near Chicago and Detroit, but no where else. The present long strait gophered edges of the two great coal areas of the east and west, facing each other across the Cincinnati anticlinal, bear no geographical relation whatever to the limits of that greater sea marsh in which the beds were deposited, but only to the directing lines of uplift which cross it in two directions at right angles to each other, elevating the whole series and

permitting the destruction and removal of all its middle portions from the surface of the present country of Cincinnati, Lexington, and Nashville. The western outcrop of which Mr. Lyon speaks is nowhere near the original shores of the marsh if the bold topography to the west can teach us anything, and therefore the phenomena which he describes, no doubt correctly, must be of those strictly local variations which occur all over the thickest and deepest parts of the coal area. We have here an analogy in fact to the discovery of fossils high on a mountain side, which were considered at first to prove the Noachian deluge, until they were discovered to be equally abundant and in the same condition at the end of the longest and deepest mines. There is nothing in geology more wonderful than that regular run of the coal beds at certain fixed elevations above the base of the series which has now been established almost beyond cavil as extending from the Delaware to the Mississippi. This reminds us that the most interesting part of the Kentucky Report is that of the Palæontology by Mr. Lesquereux, whose essay, vol. iii, pp. 501 and 556, in connexion with that of Mr. Cox, pp. 556 and 576, will have an abiding influence upon the geology of the future.

Mr. Lesquereux for the first time proves the identity of the coal beds over large intervals, not only of coal measures, but of coal denuded surfaces of Devonian and Silurian rocks, where he can have no assistance from the dynamic geologist, but must rely solely upon the nicety of his botanical classification. His success has been the reward of a lifetime of fundamental study and several years of special field-work in our coal mines, from the roofs of which he has obtained irrefragable proofs of the fact in fossil plants grouped so characteristically that it becomes a simple task of observation to determine bed from bed throughout the series. With a delicate apology in a short preface for seeming to anticipate in this Kentucky Report the publication of his first successes in this new field—successes obtained in Pennsylvania and reported some years ago to Prof. Rogers, to be embodied in the final report of that State—the amiable author opens at once upon his subject, vol. iii, p. 524, with a diagram occupying the two opposite pages of a sheet and entitled a "horizontal exposition of the different coal beds examined in the western coal field of Kentucky," the bottom line of which shows the different local names and sizes of the lowest coal bed, and the top line those of the twelfth coal bed; the intermediate beds coming in between. Then follows the Palæontology or botanical description of each bed. No. 1, the lowest or Bell, Cook, Casey, Old Distillery, Union, Hawesville, Breckenridge, Mulford Lower coal, for by all these names it is known in different places, lies in a geat bed of shales upon the conglomerate floor of the coal measures and is characterized by the prints of the bark of large trees, sigillaria, calamites, especially Lepedodendron, (L politum, Sigil. obovata, Cal. tuberculosus,) their fruit or cones, (lepidostrobi,) and many other fruits of the genera trigonocarpon, cardiocarpon, and carpolithes, looking like flattened almonds, peanuts, or peas, (although bearing no scientific resemblance to these modern fruit,) and ferns of the largest kind. The Sphenopteris is represented in this low coal by most of its species, which are scarcely

found above it, and some large pecopteris, especially Pecop. conchitica, belong to this bed alone. In this connexion Mr. Lesquereux warns us against mistaking the two small round kidney-shaped leaflets attached to the base of the large leaves of the Neuropteris hirsuta, so abundant in this bed and in fact throughout the coal measures, for the leaves of a separate plant, as the small hairs which cover them even when they grow to a large size and are called cyclopteris, are a sufficient key to their true place in coal botany. Mr. Lesquereux also here corrects the common error, consequent upon Mr. Logan's earliest researches in Wales, twenty-five years ago, and still maintaining its ground, that the Stigmaria ficoides are rootlets of a tree in the coal bed left in the white clay beneath it, by pointing out that the *roof shales* of bed No. 1 are full of them. The black shales of this bed are characterized by a small oval Lingula (umbonata,) the only shell at this geological level, and the first trace of marine conditions in the formation of the shales. The shell is found not only in Western Kentucky, but at Nelsonville, Ohio; Salines, Virginia; Rochester and Johnstown, Pennsylvania, and elsewhere.

We cannot, of course, pretend to follow Mr. Lesquereux through his careful analyses of the localities of the beds which he describes, and can only hint at their characteristics as he gives them in his valuable Report. Coal No. 2, he thinks the equivalent of Lesley's coal C in Pennsylvania, coal No. 3 is coal D of Lesley's Manual, and its shales are full of shells, large productus and spirifer. Coal No. 4 seems to be marked by Neuropteri's flexuosa, which is so abundant in the Pomeroy coal bed, of which this No. 4 is no doubt the western extension, as the Gate and Salem anthracite bed is its eastern. We leave our readers to study this fine fact upon the pages of Mr. Lesquereux's Report under his own guidance. If it be confirmed by the verdict of future students of American geology it will cover Mr. Lesquereux with honor how well deserved none will know who does not remember the chaos and darkness of the past, in which the pioneers of American science have lost and stumbled, hewn and built their way. Coal No. 5 is not well characterized, but No. 6 is recognised at once by its shales at localities as far distant as Hartford in Kentucky, and Athens in Ohio. No. 7 is known by its very small fish scales and teeth, sharp, straight and of a different form from those of the beds above. At Athens, Ohio, this important bed of fossils shows the same species and determines the scale of the measures, as it is about 100 feet below the Pittsburgh bed which is therefore in Western Kentucky. Coal No. 8 is thin and insignificant at that extreme western limit of its range as it is large and noble in the Somerset, Frostburg, Broad Top and anthracite basins of the east. Coal No. 9 is a good workable bed in Western Kentucky and is even larger than the one below it in Southern and Eastern Pennsylvania. It is therefore a more important bed than the Pittsburg bed, but never so recognised until Lesquereux's determinations of identity laid the basis of a new generalization of areas. The fossils of this bed are numerous and important; fern stems and bark of sigillaria; two characteristic shells, Avicula rectalateraria, and Productus muricatus; fish teeth, scales, and fins (in

abundance when the shells are not, and *vice versa*,) in company with a conical regularly ribbed print of the head plates of the cephalaspis, and long thin straight calamites which evidently grew in deep water. The same species of fish are found in coal No. 11, and the shells require nice scrutiny to distinguish them from shells of No. 11, so that in this instance we must fall back upon dynamic marks and notice that No. 11 is a double bed and its roof shales are finer and are covered with limestone, while No. 9 is based upon a very thick bed of fire clay. By means of this fire clay of the Western Kentucky coal, Mr. Lesquereux identified the small bed at the tunnel east of Greensburgh in Pennsylvania, and found above it the usual fish remains. Coal No. 10 "seems to be the most unreliable and inconsistent of all," "a wandering bed," high or low or absent or joined to No. 11, which is a peculiar fine well developed bed marked by fish teeth, &c. and different species of shells from those below, many pleurotomia and an avicula larger than A. rectalateraria. Its fossil plants are not so generally distributed, and the sigillaria are wanting; its shales are finer and blacker. Coal No. 12 is like No. 10, but well marked by large fish scales and large teeth (mostly double,) with two hooked points. Its coal is easily designated, being a rashy dirty compound of flattened stigmaria, calamites and some scarce sigillaria well preserved in their outlines, the roof shales covered with black band.

This terminates Mr. Lesquereux's Report for the season. He will report upon the great top rock or anvil rock, as it is called in the west, and the coal beds above that, which are of small economical importance however, next year we trust. Meantime he continues on in the remaining pages of his Report to state in admirable language his views of the formation of coal, bringing to bear upon this difficult and beautiful problem the treasures of observation and reflection of a lifetime gathered in both continents. He takes the phenomena of the Dismal Swamp of Virginia and North Carolina as his guide, and by the help of the soundings made in the peat bogs of the Old World shows how first sand bars shut out the ocean and make a continental fresh water marsh, half lake, over which grows a carpet of mosses and ferns, strong enough after a while to sustain trees, and throwing down a fine white mud: how this floating floor sags, breaks and finally sinks with its burden; how earthquakes can bring in the ocean, distribute the sand over the submerged bed, introduce salt water, shells and fish, shake the fruit from the trees and submerge, kill and finally overthrow the trees themselves; how the slow fall of the continent and the currents of the ocean remedy in time the evil, repair the sand barriers, restore the fresh lake; how a new vegetation begins again on the hummocks and spreads its floating fields again upon the waters; and how this alternation of events must have constructed the thousands of feet of our coal measures with their beds of coal and layers of different kinds of marine and lacustrine life, the marks of order and of time.

We leave with regret this fascinating book and its records of the worthy labors of worthy men, hoping to be called to renew our thanks and congratulations next spring over a fourth volume.

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